Australian Model Engineering

November-December 2000

Issue 93

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- ☑ *POEM* — an Engine with a Difference
- ☑ Build a Steam Chime Whistle
- ☑ Discover a Model Rack Railway in Switzerland

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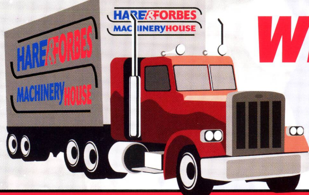

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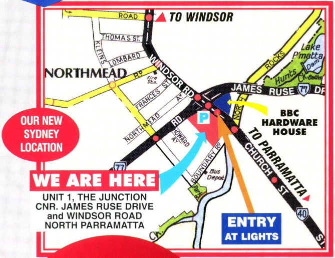

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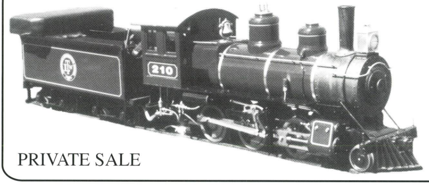
Front cover

A working live steam miniature rack/adhesion locomotive! Angel Bonvin steams his 7 ¼" gauge model of a metre gauge Brunig Railway loco on rack rail at Swiss Vapeur Park's 19th International Steam Festival (see page 21 for more). Photo: Brian Carter

BALDWIN STYLE 2-6-0



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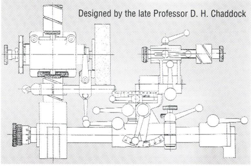

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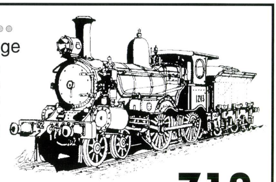

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Merry Christmas and a Happy New Year to all our readers!

As the year draws to a close so does the 20th Century (*yes, I know some of you will disagree*), and what an eventful century it has been. The history books will record that in this century man discovered flight, space travel, atomic power, walked on the moon and invented the telephone, television and computers, just to name a very small number of his achievements. And yet all this time some things remained the same. Throughout the previous century, steam was the supreme form of power and it continued to be through our century. Steam still powers the world. It does not matter whether we burn fossil fuel or use geothermal or nuclear power, in the end all all that is done is we produce steam.

It is a fair bet that steam will still dominate industry in the next century in some form or other, although it is unlikely to be in the forms ***we*** like to model. I wonder what model engineers a century from now will be modelling and whether they will be reading AME.

On behalf of everyone who is involved one way or another with this great magazine I wish you a merrry Christmas and a happy and safe holiday season.

David

Join us in a great hobby!

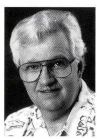
If this is your first issue of *Australian Model Engineering*, welcome!

In successive issues we cover many topics centred on that wonderful process of model engineering — alias *tinkering*.

If you're new to model engineering as well as to our magazine, you'll benefit from getting together with other model engineers — we're good at sharing ideas and saving each other money! If you don't have any contacts, start by looking in Club Round-up to find a club that's near to you. Many of our readers have discovered people with similar interests literally just around the corner.

Helping other model engineers is the simple idea of the volunteers behind this magazine. Our readers write items for us — for the same (non-existent) rate of pay! If you have ideas, opinions or techniques that you feel would be interesting to others (especially from the newcomer's angle), please drop us a line. We can send you a useful guide and help with preparing artwork or editing.

I hope you'll enjoy the great fellowship that makes our hobby special, and that you'll support our advertisers — after all, they help pay our bills!



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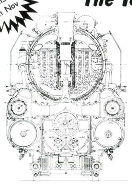

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In the last half of this magnificent book Chapelon looks at locomotives around the world, grouped by wheel arrangement and intended service. In all honesty Australasian locomotives don't figure prominently, but French, American, British and German ones in particular are covered in detail.

Long out of print, and very rare, this is the *first time* this book has been available in English. The translation is by Mr. George Carpenter, and some 70 pages have been added up dating the information in the original book, and adding details of those who have continued Chapelon's work, notably Giesl-Gieslingen, Porta, Wardale & Waller, bringing the story of advanced steam bang up to date, plus 16 pages of colour illustrations and 6 fold out drawings - these new sections being the main reasons for the delay in publication, for which we apologise.

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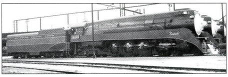

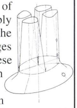

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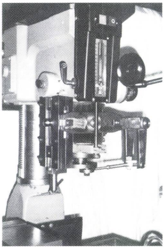

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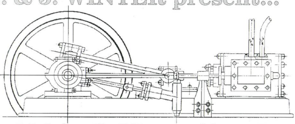

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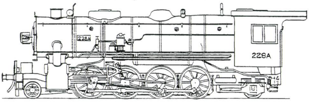

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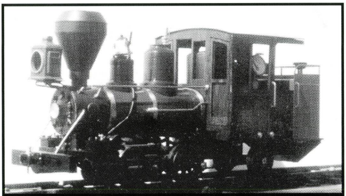

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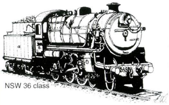

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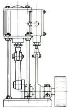

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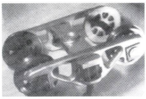

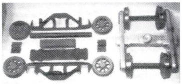

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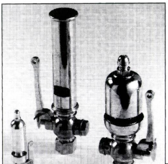

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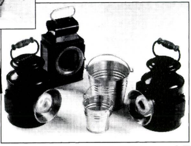

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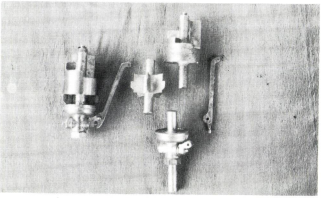

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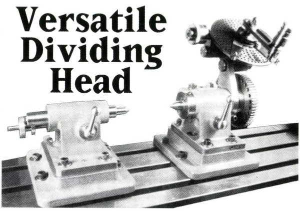

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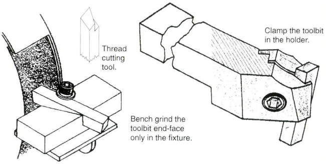
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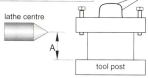

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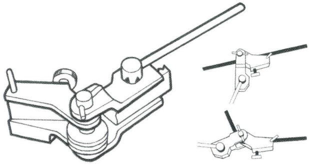

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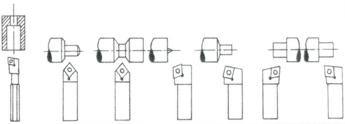

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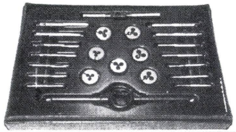

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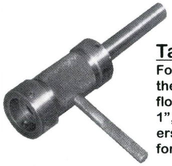

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Track and Turnout Construction

by Kevin Bruderlin

Drawings for publication by John Podmore

The late Jack Stanbridge wrote an excellent article on track gauge, curves and his 60 foot radius turnout (*AME* May - June 1996). May I be permitted to add a few comments and an addition to previous articles I wrote to *AME* on tracks.

I don't know whether Jack rolled his rails or just pulled them to shape with his jig but pulling to shape is what a lot insist on doing and is wrong. As any boilermaker worth his salt will tell you, for accuracy there is nothing worse or harder to do than to try and get something to shape without first setting, rolling or pressing the unit prior to placing in position, be it plate, angles or flat bar stiffening rings. Even curved angles or flat bar stiffening rings on large tanks and vessels are rolled or pressed with the ends cut off before attaching to the next piece if they haven't been preset. Good boilermakers will tell you it is lot harder to fit *and* slower than if the article had been properly shaped prior to attachment, leaving the completed article almost stress free.

Simple track rolls

Refer to **Figures 1 and 2**. The rollers are set up so that they roll vertically thus minimising unbending of the rolled section. A handle is shown for one roller, to assist if necessary — no gears, as with such a large radius it is a simple matter just to push the rails through. A modeller mate of mine, John Hartley drew my attention to vertical rolling and I should have remembered from my boilermaking days that vertical rollers were always best because they didn't unroll your rolled article as horizontal ones were apt to do. Unless there was support of some type, horizontal rollers were apt to break the back of large diameter curves in thin or narrow width sections similar to our rails. I think our chaps should, if they decide to roll their rails find the vertical method less bother.

Notes on turnouts

I liked Jack's points (sorry turnouts) and I like thin blades and joggled stockrails, although, like Jack, I note a lot of clubs and modellers don't. I find when talking to a lot of chaps, they appear to hold the opinion that the thin blades will collapse under the weight of the big locos or trains. They apparently do not to realise that the stockrail carries the weight until the wheels reach full blade thickness or a bit further in a lot of cases depending on rail thickness and wheel tread width. (**Figure 3**)

I have made eleven sets of points for our society, six for 5" gauge with 45ft radius turnouts and five for 7$^1/_4$" gauge all with joggles and sharp blades. The 5" gauge have operated for over 26 years. These points were all bolted and screwed to timber sleepers where minor problems have occurred over time because of sleeper deterioration. In making his turnouts, Jack suggests laying out the first and using it as a guide for subsequent sets, but if going to all the trouble of the layout why not complete it properly as a jig for subsequent use.

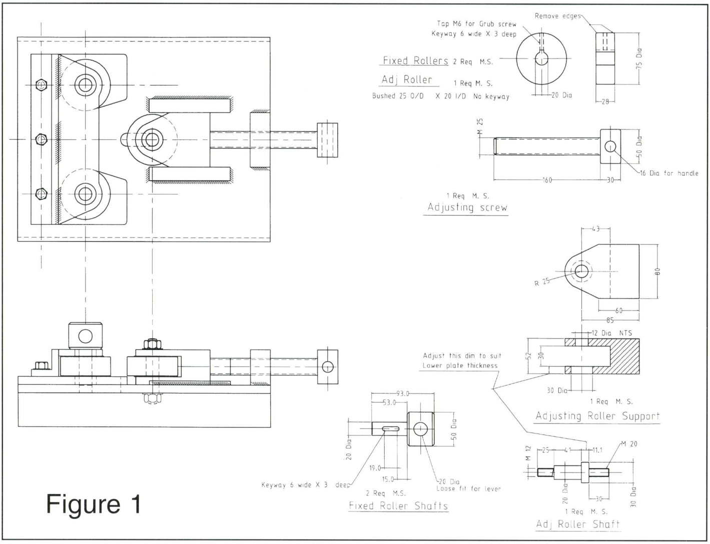


Figure 1

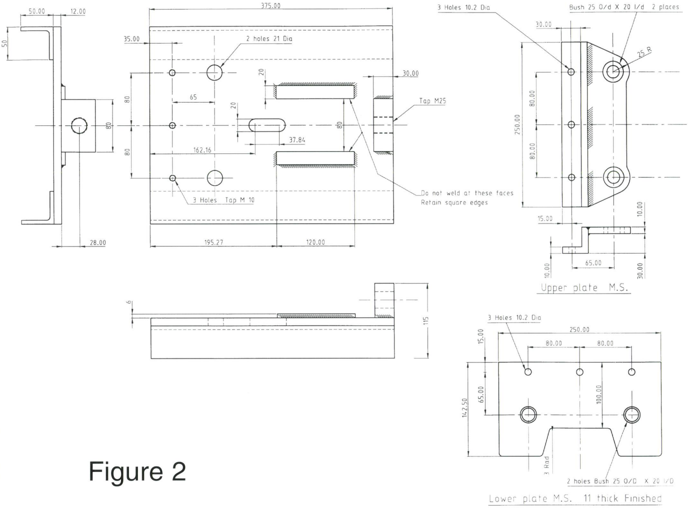


Figure 2

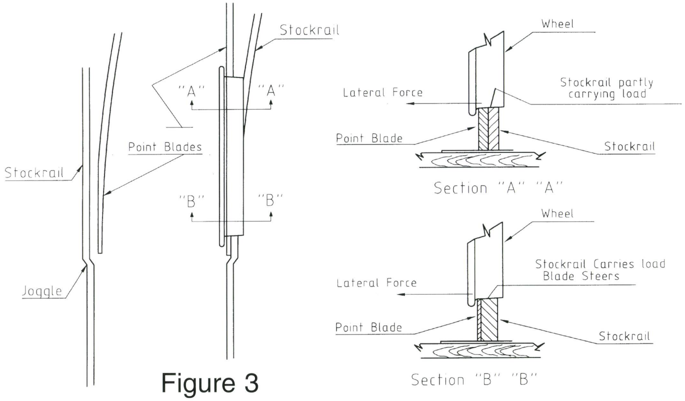


Figure 3

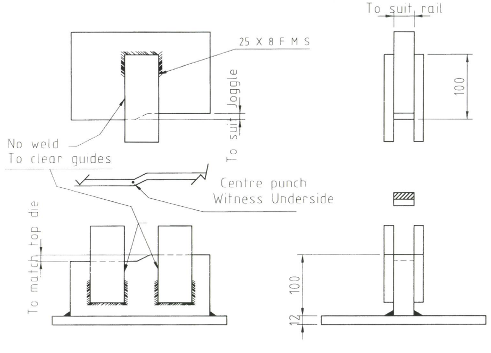


Figure 4 Suggested Joggling Tool

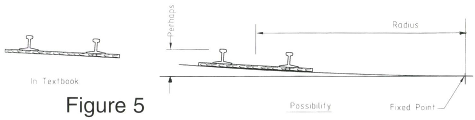


Figure 5

While on rail curves, what of super elevation? My opinion has been expressed in *AME* in previous articles but can anyone inform us of a formula to use. I have asked a railway engineer and have been informed they have a gauge but he couldn't give me a formula. Shown is a formula from an old railway and appliances railway Construction Textbook

$$E = W \frac{V^2}{1.25R}$$

in which

W = width of gauge in feet

V = velocity in miles per hour

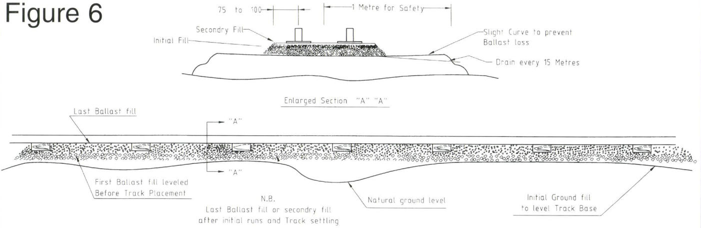
R = radius of curve in feet

E = elevation of outer rail in feet

After calculating $^{11}/_{16}$" for 5" gauge and $^{15}/_{16}$" for $7^{1}/_{4}$" at 10 mph with 50 feet radius, along with a not too detailed sketch shown in the book (**Figure 5**), it makes one wonder if perhaps they are referring to the height of the outside rail above the fixed point from which the radius is struck.

Figure 6 shows what I consider to be a correct method to lay model live steam railway tracks. This is not just a case of throwing down some sleepers in the dirt and pulling some flat bar steel with chairs welded on, screwing it to the sleepers, and for curves, pulling it to where the line is to run, only to come back later to fill the hollows and dig a bit out here and there to try and make a reasonable running surface. This appears to be what is done in a lot of clubs just to get running. I am of the opinion that if it's done right in the first place it will give better service and require less maintenance. It can become a bit frustrating when some members of a club try to do the right thing plus the biggest part of the work while some "whingers" start with "Come on when are we going to be able to run?" Things start to become slipshod to appease the mob. I am aware a lot of things are done with good intent but a little thought and patience will prove their worth later on. Perhaps a good procedure is to properly plan the track route, stations, turnouts and steaming bays as the initial step, followed by the style of track to be adopted and turnouts (points) etc. Methods of building and erection and an initial running road which, if possible, should form part of the overall plan, and appease the "whingers". Having standards and procedures set and an initial running section prepared, relieves the pressure on the workers and gives a little more time to achieve things properly.

Figure 6


75 to 100
1 Metre for Safety
Secondry Fill
Initial Fill
Slight Curve to prevent Ballast loss
Drain every 15 Metres
Enlarged Section "A" "A"
Last Ballast fill
"A"
"A"
First Ballast fill leveled Before Track Placement
N.B.
Last Ballast fill or secondry fill after initial runs and Track settling
Natural ground level
Initial Ground fill to level Track Base

POEM — an Engine with a Difference

by Murray Lane

Drawings and photos by the author unless otherwise credited

History

In late 1993 a new 7¼" track was built at Manu Ariki Marae a few miles north of Taumarunui, in the center of the North Island of New Zealand. This track was in a figure of eight configuration about 900 metres long. Just over a year later the track had been extended with the addition of a hill track of 2450 metres giving a total run of 3160 metres which takes around 25 minutes to complete. The track climbs 16 metres in about 1800 metres and incorporates two tunnels, two viaducts and a section called the Grand Canyon.

In early 1994 I started designing a new narrow gauge locomotive when it was suggested that the Marae might be interested in a steamer for the track. Requirements were to pull a load of 54 adults up the 1 in 100 grade, including an unintentional section of 1 in 40 on a bend. This last grade was caused by an unknown spring, washing the original track bed away.

Design requirements

1. To be built as a full size 7¼" gauge engine. (No restrictions on construction methods.)
2. Freelance 0-8-0 engine with side tanks and a tender.
3. Engine outline to be similar to narrow gauge Baldwin 4-6-0PT as built for service behind the lines in France in the first world war. **Photo 1**.
4. The wheels were to be small in diameter for increased torque, and as they were inside the frames they could be solid.
5. The cylinders to be inclined (outwards at the top) so that the valve gear had the correct offset from the cylinder centre line and were to be easily attached to the frames.
6. Different type of valve gear to most engines built.
7. Construction was to be as simple as possible. Although I have nothing against full size engine construction, it seems to me, that many of the old designs were very complicated, i.e. Black 5s.
8. Steam passages to be as free as possible, with no constrictions.
9. All water tanks to be made of stainless steel.
10. All motion work to have ball races where possible.
11. Vacuum brake system with simple linkage.
12. To be bright colour which appeals to the fairer sex and children.
13. No side windows in the cab.
14. Slide valves to be used.
15. Briggs type steel boiler of 30 litres capacity.

General arrangement of the final design is shown in **Figure 1**. All objectives were met and the building time was halved (1200 hours)

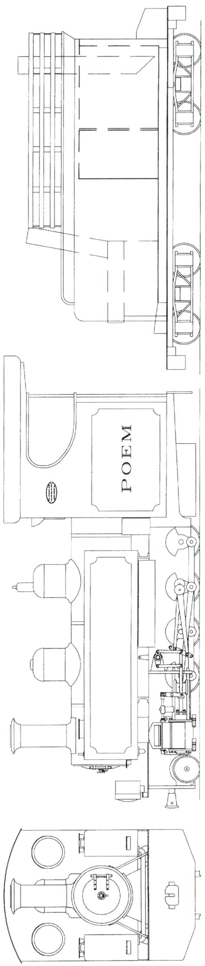


Figure 1. General Arrangement

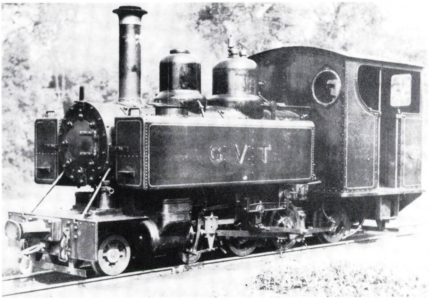


Photo 1*. Baldwin 4-6-0PT built to 2 ft. gauge for behind-the-front-lines service in the First World War*

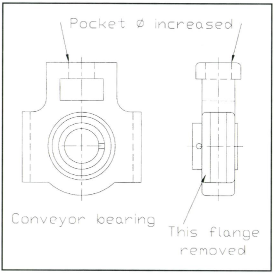


Figure 2

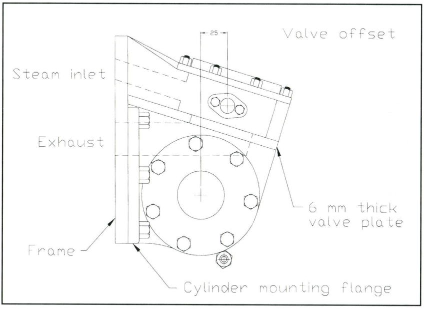


Figure 3

from a similar engine using conventional construction methods.

Later on, mention will be made of changes made since *POEM* was completed, and also design features that I feel would improve a similar project.

Frames

The frames are made of 16 mm steel plate and are thick enough to tap 8mm threads in the edges. Buffer beams are 12.7mm. The frames are bolted together using two 38mm diameter stretchers with 12mm csk cap screws. This method holds the frames square in both axes. The distance between the frames is increased behind the rear drivers to allow a wider grate to be used, and the buffer bear beams are welded on (**Photo 2**).

Axle boxes

Conveyer take-up bearing units were used for the axle boxes. These contain a self-aligning ball race in a cast iron frame which have side grooves. The groove lip on one side was machined off flush with the bottom of the groove, and hey presto, they were ready to fit directly in the frame gaps. As a bonus, the top of the bearing units have an extension with a hole, which make great spring pockets. As *POEM* is a heavy engine I had to increase the diameter of the holes to take larger springs (**Figure 2**).

With small diameter wheels the wheel base is short for an eight coupled. These are solid and are machined from EN8, and are keyed to the axles, as are the outside crank webs.

Cylinders

The cylinders were a little difficult to machine due to the angle of the valve face. The ports were cut into the castings before suitable car cylinder liners were fitted. These were bored to final size after fitting. There is a 6mm thick valve port face which fits between the cylinder face and the steam chest. This is located with dowel pins. Makes machining accurate port faces a piece of cake.

The cylinders bolt onto the frames via webs on the castings and are directly attached with six 8mm bolts from the outside (**Figure 3**).

The exhaust ports connect to the Y junction via outside tubes with 'O' rings set in groves inside these tubes, a-la Dave Giles' *Phantom*. The tubes are free to slide side ways and it is an easy method of connecting difficult pipe work (**Figure 4** and **Photo 3**). The cylinders can be removed without removing the inner tube connected to the cylinder.

Piston and guide bars

The pistons are attached to the piston rods via tapers with a 5 thou gap to the cylinder walls. Two car piston rings, (they have a much deeper section than thickness) are fitted in the one groove with the gaps 180 degrees apart. The gland and cross head with cast iron slippers, locate the piston in the cylinder so that it does not touch the wall. The rings do all the sealing necessary.

There are two guide bars with the rear end attached to the motion bracket. This bracket is held to the frames by two bolts with another two bolts holding the weigh

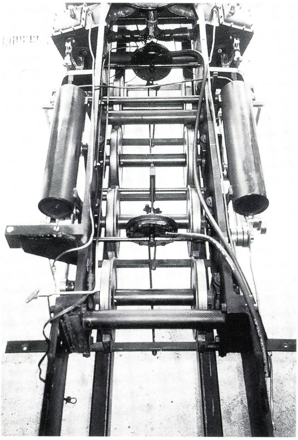


***Photo 2**. Chassis completed showing increase in width of frames and brake rigging*

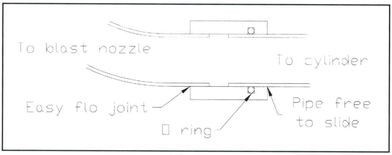


Figure 4

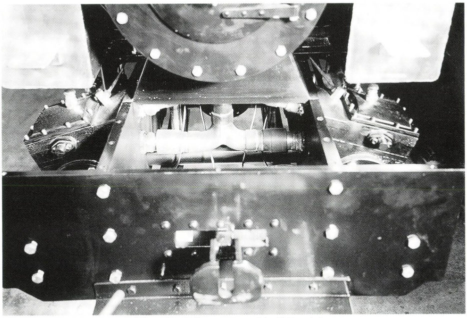


Photo 3. Exhaust pipe with sliding joints

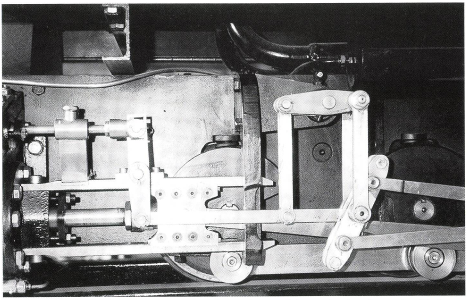


Photo 4. Valve gear layout which shows the mounting of the motion bracket and guide bars

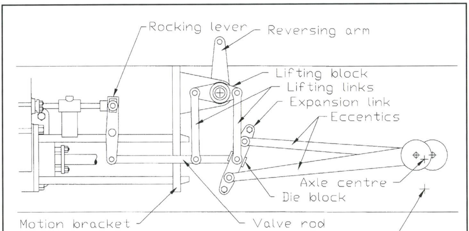


Figure 5

shaft bearing blocks to the bracket. All very simple and substantial (**Photo 4**).

Motion work

The coupling rods are fabricated, as per Harold Sinclair"s locomotives, where each rod between axles is separate. No knuckles are required. The rod connecting the two middle axles is outside the others. Ball races are fitted inside the rod ends. Although they may not look right it is a most practical method of making multiple rods. The connecting rods have self-centring ball races in the large end and three ball races (required for the loading) in the small end (**Photo 4**).

Valve gear

Allen valve gear was chosen as it has rarely been used in miniature locomotives. LBSC's *Mable* being the only one I know of. Allan valve gear lies between Stephenson's, (the expansion link faces to the rear) and Gooch's valve gear, (the expansion link faces forward). The expansion link in Allan valve gear is straight and there fore very easy to make (**Figure 5**). For those who wish to know more, I refer you to the article in the *Model Engineer* 1909 Vol 21 pages 570 to 572, by H Muncaster, a well known authority on steam engines in the early part of the last century. This is the only write up on Allen valve gear that I have seen, which explains how to carry out the required calculations for the layout.

Self-centring ball races were used in the pivots of the eccentrics to the return cranks. I was unable to get sealed bearings for these, so made my own out of plastic sheeting. These are held in grooves in the rods and are popped in place in the same manner as a watch glass is fitted into a watch. I found that it was very difficult to machine the key ways in the return cranks at the angles I wanted. Unfortunately with the layout I have used, the inside crank is for reverse gear. This was caused by the rocker shaft which very neatly lifts and reverses the motion from the radius rod to the valve rod. Any error in the reverse crank angle also affects the forward gear more.

The expansion links are made of 6mm gauge plate and are very simple to make. The outside die blocks are cast iron. All pins are made of 4140 steel running in cast iron bushes. (**Photos 4 and 5**).

Smoke box

The smoke box internals are kept clear for easy access to the tubes for cleaning. The blower ring is built into the petticoat fitted in the bottom of the 100mm diameter stainless steel chimney tube (**Photo 6**). The brass chimney top is shrunk on to the stainless pipe with a 17 thou shrinkage. A square shaped plate and simple turning on the bottom of the chimney, proved to be a satisfactory and easy method of mounting it on the smoke box (**Photo 7**).

The smoke box door is fitted with a typical dart lever and a stainless hand wheel, a-la Bob Nash's *Koppel*, which I

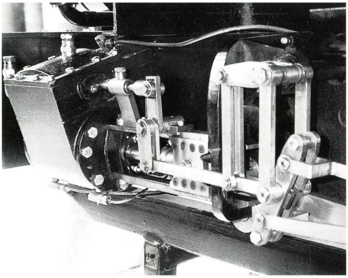


***Photo 5**. Valve gear. Rocking lever support is mounted on the top slide bar. Note die block in top pivot of rocking lever and unusual die block in the expansion link*

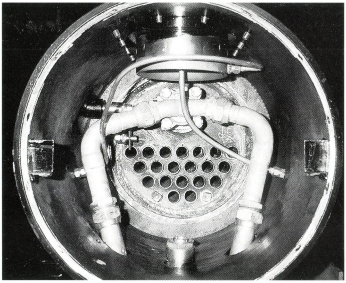


***Photo 6**. Inside smokebox. Note easy access to tubes. The $^1/_4$" pipe from the right hand side is the ejector exhaust*

much admired when at the Brisbane convention some years ago (**Photo 8**).

Boiler

The Briggs steel boiler is fairly standard although the nest of water tubes in the firebox is somewhat more complex than any others I have seen. There are three water intakes, two from near the front of the boiler, and one from just in front of the firebox feeding the lower water ring. Ball blow-down valves are fitted to each of these before going into the firebox. One of these is fitted with a standard water tap thread and provides a convenient point at which to fill the boiler (**Photo 9**).

56 uprisers join the lower and upper header water rings with six outlets from the upper ring connected to the crown sheet. The sides of the firebox are bolted on for easy access and are lagged with 20mm Kao board. Kao board can be recommended for this purpose. It has better insulation than fire clay and can be cut with a sharp knife and is very easy to fit. I will not try to explain the disaster of trying to line the fire box with what must have been very old fire clay. The bottom 50mm of the Kao board is protected by a 0.8mm stainless surround.

The fire arch is made up of separate 40mm overlapping strips of 5mm stainless bar, and rests on the top of the upper water circuit (**Figure 6**). As per all the engines that I have built, there are only two injectors for boiler supply and in

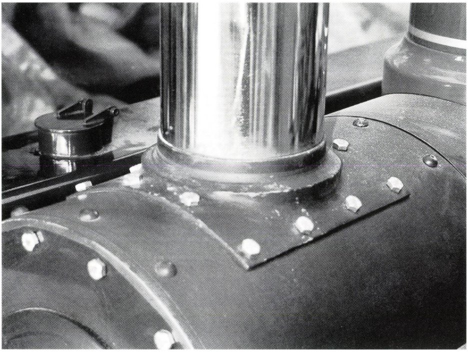


***Photo 7**. Chimney mounting*

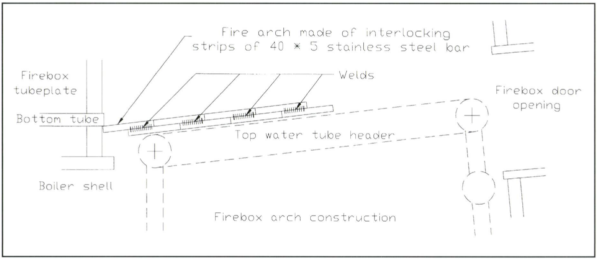

Fire arch made of interlocking strips of 40 * 5 stainless steel bar
Welds
Firebox tubeplate
Firebox door opening
Bottom tube
Top water tube header
Boiler shell
Firebox arch construction

Figure 6

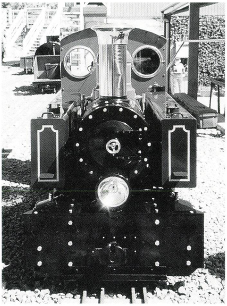


***Photo 8**. Front-on view*

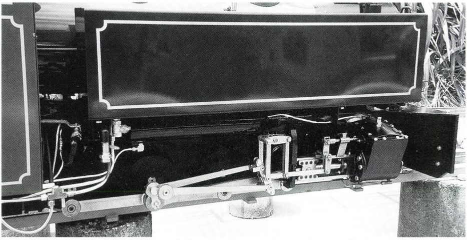


***Photo 9**. Blow-downs on right hand side just in front of cab and below tank level*

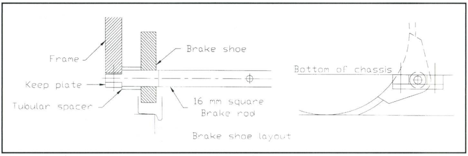


Figure 7

many years of operation there has never been any problem with keeping water in the boilers. The water supply is via easy to reach ball valves on each side of the rear cab floor (**Photo 10**). These are fed from both, tender and each side tank respectively.

The boiler is lagged, including the back head with 20mm Kao wool. This gives 40mm of insulation between the fire and the cab. The back head is sloped and consequently the fire box door which has a 20mm air gap to keep it cool, and also includes the top air damper control, will remain in the open or closed position as required, and does not require a catch (**Photo 10**).

There is a large ash pan which allows several hours running on high ash coal. The right hand side is hinged at the top and the pan can be easy emptied without placing the engine over a pit. The original bottom dampers on the sides were changed to a single rear damper, which is controlled by a sprung loaded vertical control through the cab floor.

The grate is made of 20 x 5 stainless steel strips with a 10mm air space. My *Speedy* which is 26 years old, has a 12 x 5 grate and is still as good as new, and fire regularly runs white hot. The completed grate was cut into six sections, and these can be inserted through the firebox door, which is large enough to put your hand and arm through.

Cab

The cab is made of 2mm steel bolted together, no frames are used. It is attached to angles bolted under the side edges of the cab floor, by six 6mm bolts. It can be quickly removed as it can be lifted clear of all fittings apart from the lubricating tank, with out disconnecting any pipe work. The front spectacle windows are fitted with brass sun shades, which improve the look of the engine. The two displacement lubricators are easy to see as the view is in line with the left hand window (**Photo 10**).

The turret with the steam control valves is supplied from a socket at the rear of the boiler. The front dome is a dummy and would normally be used as a sand supply. Two safety valves and the whistle are mounted on top of the rear dome

The water gauge glasses have protectors and have plates behind with diagonal black and white strips, which makes the water level easy to see (**Photo 10**). If compressed air is available, an air coupling

***Photo 13**. With Dave Giles at the controls,* POEM *leaves the station at Havelock North*

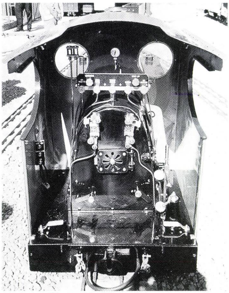


***Photo 10**. The cab interior*

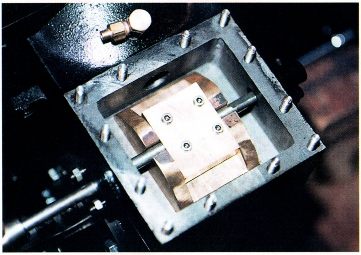


***Photo 12**. Original phosphor bronze D valves, lubricating nipple above*

***Photo 14**. The author at the controls climbing the hill in Havelock North* Photo: Ian McKay

mounted below the cab can be connected into the blower circuit by one of the valves mounted on the steam manifold. This valve is isolated from the manifold steam circuit.

Brakes

The brake blocks are held on rods which are free to move in captive slots in the bottom of the frame edges, a-la Harold Sinclair engines. No complicated hangers are required (**Figure 7**). There are two 100mm vacuum units connected with simple self compensating rods for each two pair of wheels (**Figure 8 and photo 2**) and there are two large tubular copper tanks, under the stainless steel side tanks, which are for vacuum supply. A continuous running ejector of my own design pulls up to 26 inches of vacuum.

There is a proportional brake valve mounted on the cab floor on the right hand side. These are built the same as the Burkes Pass Railway engine (*AME* issue 56, 1994) with the valve face at the base of the stand. The moving disc is made of phosphorus bronze and the fixed disc which has the pipework screwed directly into it, is made of teflon. There is a gauge for the vacuum supply and another for the vacuum applied to the brakes (**Photo 10**).

Regulator

The ball regulator mounted in the smoke box (**Photo 6**) is controlled by a large lever in the cab, which is shut when the lever is in the rear position. If the coupling parts, and I have seen it happen several times on other engines, the regulator will automati-

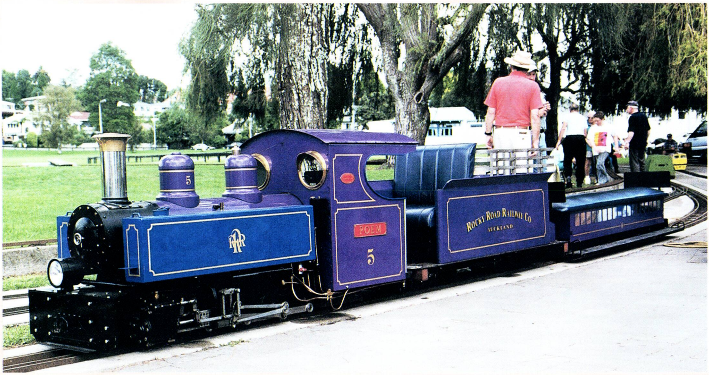


***Photo 11**. The complete set-up at the Tauranga Convention in January 1998.*

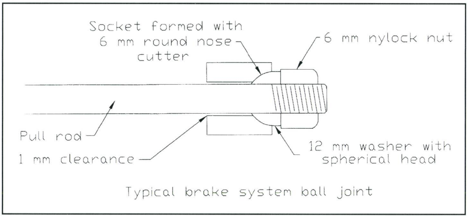


Figure 8

cally be shut as the engine pulls away. But with a 40 x 10 coupling using screw down 10mm cap screws as pins, it should never happen.

Due to a 19mm steam supply via 60 x 6mm ports and a 25mm exhaust system, the engine breaths very easily and if the grade increases, it just leans into it and keeps going at the same rate. It pulls very hard with pressure down to 40 psi.

The reverser quadrant is just a curved strip with the notches cut into it. It is bolted to a plate attached to the frame at the front end only.

Tender

The tender frame is made of RHS tube and the upper steel body work, which is one piece, is bolted to the foot plate in the same manner as the engine cab. There is a separate stainless steel water tank inside at the back, which is provided with an automatic overflow and a drain ball valve on each side. The engine is fed via separate water pipes on each side.

A separate compartment with a hinged cover is situated between the water tank and the coal bunker. The battery, tools and rags etc. are kept in this area. Coal is conveniently shovelled out from under the middle of the comfortable seat.

The two bogies are each fitted with a vacuum unit and braking is applied to all wheels. A hand brake is mounted on the front right of the tender.

At the rear of the tender is a large tool box (as per *Phantom* tender),which is a handy place to keep couplings, pins vacuum hoses etc. I was rather taken with John Harman's (Havelock North club) *Li'l Lima* wood storage area with stainless steel bar tender top extension, so *POEM* has one of these as well.

Headlight

Although the original engines were not fitted with head lights, a number of the narrow gauge 4-6-0PT Baldwin locomotives ended up in India. These have monstrous tear drop shaped headlights mounted on the front above the smoke box. *POEM* has a 55 watt spotlight mounted on the front buffer beam. It can be removed quickly by undoing a knurled screw and sliding rearwards off the mounting. I think it suits the engine, but a spotlight is at a disadvantage going around corners at night, due to the narrow beam (**Photo 11**).

Engine trials

The engine runs well and is similar to Ian Smith's *Bunyip* in this respect, which I had the pleasure of driving at the convention in Newcastle last year. It sounds and moves in much the same way. The driving position is comfortable and there is plenty of room to move around. If I was building another I would put the foot rests down lower as on Ian's engine.

I found that the engine would hop off the rail at the Havelock North track, coming off the end of the first concrete viaduct. There is a very abrupt entry into a corner at this point, and is on a down grade, and the small diameter driving wheels had trouble following the outside rail. The engine has since had a front bogie fitted which helps it track this corner better.

The other problem encountered was caused by the loading of the large D valves on the valve gear. The original D valves were made of phosphor bronze (**Photo 12**), and distorted badly after a few hours running, so new balanced valves were made of cast iron and have since eased this loading. The valve piston rod valve clamps both cracked where the rod passed through. These have been replaced with stainless steel units. The boiler makes plenty of steam and with the injectors and firebox door air control, the steam pressure is easily controlled.

Due to difficulty of maintenance of the engine by suitable qualified personnel, the engine was not purchased by the Manu Ariki Marae, and for the past few years has been run by the builder at infrequent intervals.

Reflections

I'm not noted as an engine driver, a few laps on engine is enough for me — it is the building that I enjoy. The engine only just fits in my Toyota van with the passenger ride car (**Photo 11**) which has fold up foot boards. This is mounted above the RHS wheel arch. The tender is towed on a purpose made trailer. It is a major job for a 1600 cc automatic van to transport the above, particularly to Havelock North where three major hills see the van in bottom gear for many miles.

I wonder sometimes why older engineers keep building larger locomotives.

Would I change any of the design parameters? Yes!

1 An inclined cylinder is not easy to machine, as it is difficult to set out centres. The average home model engineer would be struggling to carry this out. The cylinder block would be all square.
2 To decrease the loading on the valve gear, but still using large ports, piston valves would be used in preference to D valves.
3 Although I am quite happy with the Allen valve gear, it was found very difficult to key the double crank correctly. The next engine would have some other type. Just to be different!
4 The boiler would be a full locomotive type. I will never build another Briggs type.
5 Access to the pipework under the smoke box would be modified. When using large pipes more room is needed to use the spanners on the nuts.

Specifications

Mechanical

Wheel arrangement	0-8-0, 2-8-0
Bore and stroke	70 x 94mm
Length of engine	2085mm
Total length with tender	3675mm
Height	900mm
Width	600mm
Engine weight empty	490kg
Tender weight empty	180kg
Engine weight loaded	567kg
Tender weight loaded	360kg
Wheel dia. driver	166mm
Wheel dia. tender	275mm
Wheel dia. Pony truck	114mm
Fixed wheel base	615mm
Water capacity	120 litres
Coal capacity	35kg

Boiler

Type	Briggs
Capacity	30 litres
Internal diameter	200mm
Total length	1200mm
Lgth between tube plates	843mm
Grate size	300 x 294mm
Fire tubes (20 of)	19mm OD
Ash pan	330 x 320 x 100mm

En Voiture! All Aboard!

Story and photos by Brian Carter

My wife Sue and I were privileged to attend the 19th International Steam Festival held in Bouveret Switzerland between the 23rd and 25th of June 2000. The venue was one of the most amazing live steam locations we have ever seen. The Swiss Vapeur Parc (Swiss Steam Park) at Le Bouveret is nestled in a picturesque corner of Lake Geneva (Lac Leman) by the mouth of the Rhone River. The backdrop for the park was some of the spectacular Swiss mountain ranges. The area is the heart of Chablais grape producing part of Switzerland and there were vinyards in some rather precarious locations on the sides of the mountains! A small problem for us was that the steam park was in the thick of the French language area of Switzerland only a few kilometres from the French border, and neither of us spoke French! Fortunately we met some English-speaking people in the park, two of whom had been to Australia so all was not lost.

Looking down towards Chablais Station (1) from above Tour de Feu (17)

(Note — numbers in photo captions refer to the numbers in the site plan at the foot of this page)

The same weekend was the celebration of the 100th anniversary of the nearby Aigle-Leysin Railway at Leysin. There is a close association between the Aigle-Leysin Railway and the Steam Park, and the festival weekend coinciding with the 100th anniversary strengthened the bond. Besides the model of an Aigle-Leysin train running at the Steam Park, the festival gave the opportunity for the opening of what could be the first operating model rack (cog) railway system. The model is identical to the full-size rack system used on the TPC (Transports Publics du Chablais). This is a great achievement for the members of the park and makes it unique among the world's live steam venues. If you are aware of other model rack steam lines please let the Editor know.

The festival

We arrived at 8.30 on Saturday morning and were warmly greeted by Claire Veuthey whom I had contacted before we left Australia. Claire met us at the entrance and explained the proceedings and ushered us into the large marquee erected in the car park for the Festival. There were several displays of models and trade stands around the walls of the marquee and many rows of tables for meal sittings. We hadn't seen any of the park at this stage so when we walked out into the track area to find the station we were dumbfounded at the sight that lay before us. Activity was very slight so early in the morning, but there was steam in the air! We flagged down a ride on the first available train and headed off for a lap of the park.

During the circuit of the park we couldn't believe our eyes. There were a castle, a bank, restaurants, stores, a church, many tunnels, a completely operational miniature roundhouse and turntable area, and even a large-scale cold store (used to store the drinks and ice creams).

We finished the ride and wandered around the well-paved pathways towards the miniature village. Each of the village buildings was constructed to about $^1/_5$ scale and all the buildings were modeled after buildings from the district. Two of the buildings were souvenir stores in disguise, which left us a little poorer!

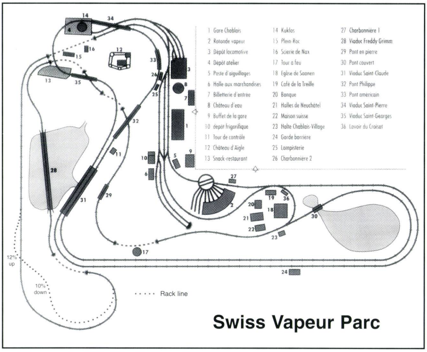
The delegation

There were delegates from many countries such as Switzerland, of course, Italy, France, Spain and Germany, Belgium, Luxemburg and Austria. Several delegates from the UK also attended as well the two of us making up the Australian contingent. There were 70 locomotives present, 68 running and two on static display. 50 locomotives were 5" gauge and 18 were $7^1/_4$" gauge. The proportion of 5" to $7^1/_4$"gauge was similar to our AALS Conventions.

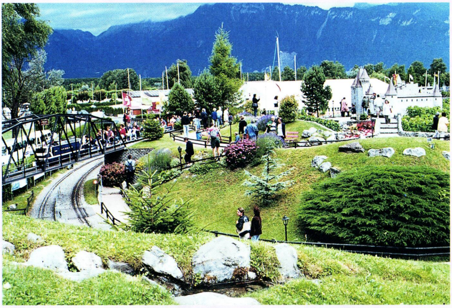
The rack railway

The highlight of the weekend was opening of the $7^1/_4$" gauge rack system extension to take place at 11am so we headed off the ribbon cutting location as the crowd began to swell.

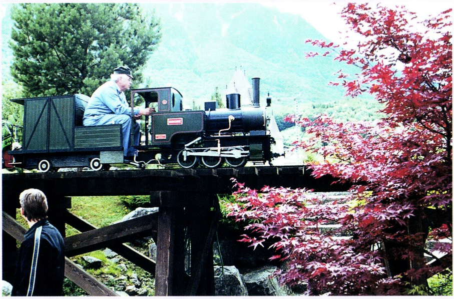
The star of the show was Angel Bonvin and his narrow gauge 0-6-0 rack/adhesion $7^1/_4$"gauge live steam locomotive based on a locomotive that ran on the metre gauge Brünig railway. The locomotive eased up to the white ribbon strategically placed between miniature posts at the crest of the grade. The President of the club, M. Pierre Jaquerod and the President of the community of Port-Valais, M. Claude Roch, made the speeches. Fortunately for you they were all in French and I haven't a clue what was said! However, there was the feeling of the typical camaraderie associated



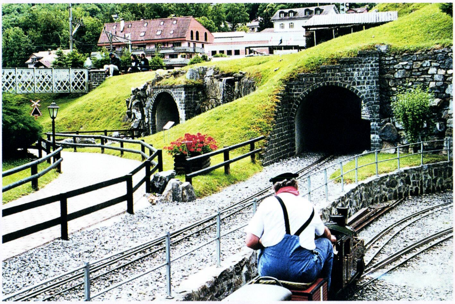
Swiss Vapeur Parc



From above the sawmill of Nax (16) across towards the main entrance (7). Note the Chateau d'Aigle (12) to the right and the impressive mountains in the background.



What a back drop! The driving truck behind 0-6-0T Rhone *is of an unusual design and was put to good use by this gentleman and his lady, who shared the driving.*



Looking back in the general direction of the top photo as Angel passes on his rack loco

with any live steam gathering. There is a strong bond between the club and the local community which is 100% behind the Steam Park. Local people carried out all of the work in the park.

With the speeches over, the two Presidents cut the ribbon and the train advanced a few metres past the ribbon to great cheers and applause. Angel left the train securely parked and joined the crowd gathered for the several bottles of Champagne and Chablais that were opened for the celebration. Plenty of sumptuous food completed the opening party, the Swiss sure know how to celebrate! After the festivities died down, about half an hour later, Angel boarded the locomotive and continued on the journey down the grade to rejoin the mainline.

The rack rail extension is a short diversion off the mainline to provide additional entertainment for both drivers of rack-capable locomotives and their trainload of riders. It was impossible to get a clear photograph of the train climbing the grade due to the large spectator presence! The grade is 12% up the hill and 10% on the downgrade.

It wasn't until this time that we were able to meet with the club President. He didn't speak English but he welcomed us through Georges Gachnang who kindly acted as an interpreter. Georges took us on a tour of the park and explained some of the details as best he could.

We were invited to join the official party for lunch and met a few others who spoke English. It was a very satisfying lunch in great company. We were introduced to Mario Henzi who took over from Georges as my guide and took me to the "inner sanctum" of the workshop while Sue continued chatting with our newfound friends in the marquee. The workshop is quite large and well concealed under a mountain and they have plenty of room to work. The track comes in at ground level but is set at waist height inside the shop due to the sunken floor. The whole arrangement was well organised and very tidy.

Angel had stabled his Brünig loco so we missed out on a ride up the 12%. Mario arranged with Angel to steam his loco for a special run for us which we greatly appreciated. When the Brünig train arrived at the station we were swamped by the crowd and were lucky to get a seat, it's a very popular ride. The train headed off to the "hill", unfortunately steam pressure was a bit low so the train needed 0-2-0 assistance. On the way back to the station we were told to stay on the train for a second run. The second attack of the 12% was much better with the safety valves lifting at the foot of the grade. The train slowed to a crawl as the driver switched from adhesion to rack propulsion and then only slightly accelerated to "rack speed" to climb the hill. The locomotive had no trouble hauling the fully laden train up the grade and control the descent of the 10%. It was a very special thrill to be part of this event, much better than the big sports carnival we recently had.

After the ride on the rack railway and to continue the hospitality, Mario approached Georges and his brother Claude and asked them to show me their latest production. Out of the workshop rolled an enormous chassis. The propulsion was a Toyota Starlet 1300cc car engine powering the hydraulic system of three motors. The prototype of the model is a modern giant of the US Amtrak fleet, a Genesis 1 diesel electric locomotive. The model is expected to weigh about 2000kg!

More party

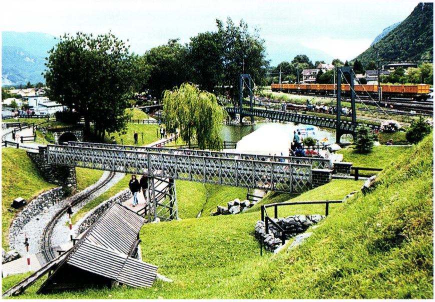
Later in the evening we gathered once again in the marquee for the evening meal. We sat with our new friends and joined in the festivities. The club had produced a 180-page anniversary book written by a lovely lady, Ada Buscaglia and I can see I will have to learn some French so I can read all the literature about the park. All the delegates received an autographed copy of the book.

The evening speeches were very short and sweet, then on with the meal, many large platters of fresh fish, meats, fruits, salads and vegetables, all to the tunes of a live oompah-pah band playing traditional Swiss mountain music. The timing was mid summer in Europe and with daylight saving it didn't get dark until 10pm. It was a long wait for a night run!

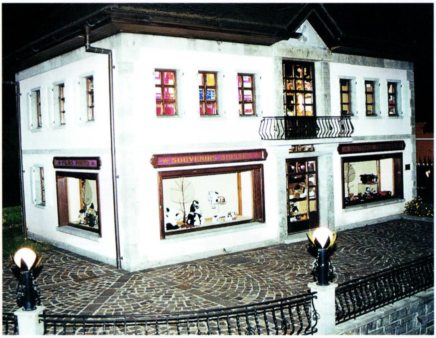
The park at night was like most night runs, but this one was full of special lighting on bridge decks, footpaths, building exteriors and interiors. It was the like we had never seen before. The train ride was like riding through a miniature fairyland, like the large Marklin layouts we often see at model railway exhibitions. I always thought the Marklin layouts were a bit fake, but that is exactly the way the real scenery is over there! We rode the trains until about 11.30pm and decided to call it a day. It was a unique experience for both of us, a memory we will treasure for a long time. Our sincere thanks to our new European friends for their hospitality.

Park history

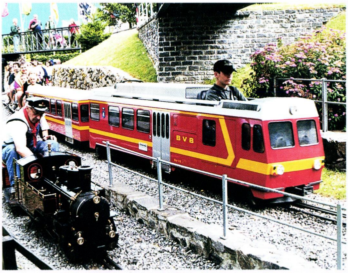
The Aigle Steam Club was founded in 1979. Some track was ready for the inauguration of the Aigle Miniature Railway's first Annual Steam Festival in 1980. The club moved to Le Bouveret on about 17,000 m^2 of land in the Borough of Port-Valais and changed its name to the Chablais Steam Club in 1987. In 1998, the 8th Steam Festival became the inauguration of the Swiss Vapeur Parc.



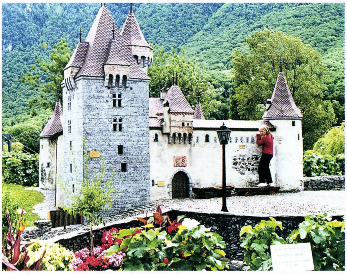
The replica George Washington suspension bridge (28) from Kuklos (14)



Like all the buildings this souvenir shop is not quite what it seems. The interior is a one room shop and the windows on the upper floor are about 5-6 feet off the ground.



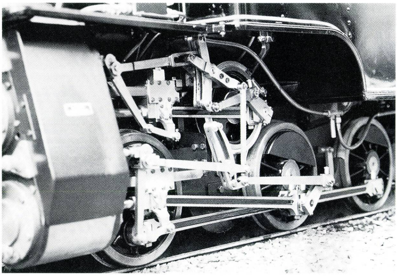
This eye-catching 7$^1/_4$" model of a BVB 2-car diesel train was built by Claude Gachnang



The Chateau d'Aigle (12) at 1/8 scale is an exact replica of a fortified medieval castle from around 1476.

An incredible achievement for a team of volunteers working over 90,000 man-hours over such a short time frame. The success of the Park is largely due to the support of the Borough of Port-Valais and district. Everyone sees how important the Swiss Vapeur Parc is to the area and is keen to assist where possible. The Park is so popular that it opens daily between 19 March and 1 November and closes during the snow season. From 19 March to 14 May and 19 September to 1 November the Park is open 1.30pm to 6pm weekdays and 10am to 6pm weekends and public holidays. Between 15 May and 18 September the Park is open every day from 10am to 6pm.

The price structure was interesting: Entry fee is 10 Swiss Francs per person (includes unlimited rides on the trains). Price for family entry is 8 Swiss Francs per person. Groups of 10 people or more is also 8 Swiss Francs per person. School excursions are charged 6 Swiss Francs per student. You can also purchase an annual ticket for 50 Swiss Francs per person. All tickets include train rides.



The motion work on Angel Bonvin's rack locomotive (also see front cover)

To ease the burden on members, the club owns about seven steam locomotives and four petrol hydraulic locomotives, each hauling five to 10 carriages each. On a normal day the trip around the park takes about 15 minutes and there is a departure from the station about every ten minutes. However, on an Internation Steam Festival weekend it is another story!

Park construction data

Some data about the Swiss Steam Park that you should find interesting. The park operates 5" and $7^1/_4$" gauge. They added about 15000 cubic metres of soil and fill to build up the topography of the land, and used about 5000 metres of electric cables. There are 1500 metres of main line and over 500 metres of sidings and secondary lines with 16 turnouts.

The locomotive service area has eight tracks for the roundhouse, two cleaning pits, one coaling track, ten tracks to store locomotives, one track to unload visitor's locomotives. Two tracks provide access to the roundhouse from the mainline.

The Signalling system comprises of one control tower, one signal box for turnout control, one footbridge mounted with a signal system at the exit of the station, three sets of coloured light signals, two station bells, and twenty four level-crossing flashing lights and buzzers.

The Railway system has one station with a station building and covered platforms for tracks 1, 2 and 3, one merchandise shed with a loading platform, one 4,500 litre water tower, one covered hall, two-compartment coal bunkers, one locomotive shed, one refrigerator warehouse, one main tower serving as control tower, one lantern maintenance room and one level-crossing keeper's house used for storage of maintenance material.

Major engineering structures consist of: one 15 metre steel bridge; one 6 metre keystone rock bridge; one 8 metre wooden covered bridge; two 15 metre girder bridges; one 23 metre girder viaduct with double tracks; one 12 metre wooden trestle bridge (American style construction); one 13 metre dam retaining structure with arches, one 50 metre span suspension bridge based on the George Washington Bridge in New York. Construction time was about 6,000 man-hours.

The park has several tunnels: One 12 metre tunnel with stone portals, one 6 metre tunnel with portals of which one buttress and one with two entry-towers; one 14 metre tunnel; one 17 metre tunnel on an S bend; one 19 metre curved tunnel.

Visitors to the park are accommodated with 1,200 metres of well paved pedestrian walkways which include: one 8 metre footbridge, two bridges over the waterways, one passage way on top of a dam and one 8 metre pedestrian stone bridge. All the pathways are floodlit for use during night-runs.

The park construction includes several lakes — two lakes of 340m^2 and 150m^2 each arranged on two levels separated from each other by a dam, one 700m^2 lake for operating scale model steamboats, motor boats or sail boats (wind permitting).

Locomotives and rolling stock

Because of the frequency of operation, the club has had a collection of locomotives specially built for day-to-day use. This leaves members' locomotives free for special days and play days.

The impressive turntable and the large capacity roundhouse (2) it serves

The club trains are made up of one or two locomotives that are coupled to between four and eight passenger cars. The trains are put into operation as needed depending on demand.

The Swiss Vapeur Parc operates 10 locomotives (see table on next page). Of these six are live steam, five are coal fired and one is fired with gas. Four self-propelled cars have a built-in petrol (gas) engine with hydrostatic transmission.

Buildings in the park

The Aigle Castle was built in original materials to a scale of $^1/_8$. The original castle dates from 1475. The Station buffet serves as a cafeteria for the Chablais-City railway station and was built to a scale of $^1/_5$.

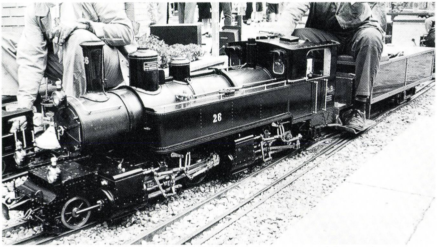
In the Chablais-Village, the Old Treille cafe serves as a coffee shop and was built to a scale of $^1/_5$. The Saanen church, an exact copy, but a mirror image of the original was built to a scale 17cm/1m. The outside walls are painted with some frescos as seen on the original church.

The $^1/_5$ scale Swiss residence, used as souvenir shop, has a sculptured sandstone facade and Mansard roof to the 1800s period. The Market halls of Neuchâtel, circa 1570 with exterior facade made of local stone and the front wall adapted to the style of the period, although built as a mirror image of the original, are to a scale of $^1/_5$.

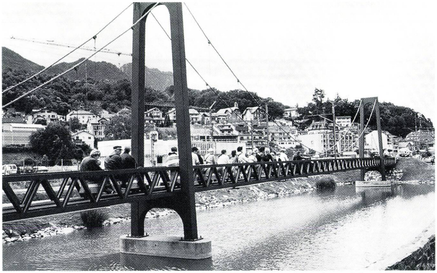
A Bank building complete with carved stone panels on the exterior walls was modelled in $^1/_5$ scale featuring the style of a bank of the 1870s on outside, and the interior modelled in the style of a bank of the early 1900s.

In other locations around the park are: a watchtower as used during the Savoy era, still to be found in the Rhone-river valley (near Saillon-Saxon) and rest rooms and maintenance workshop No.3 constructed beneath the mountain. On top of the mountain stands Kuklos, a model in $^1/_{10}$ scale of the revolving restaurant Berneuse at Leysin, above Aigle. Also on the mountain is Plein-Roc, a model in $^1/_{10}$ scale of the restaurant Plein-Roc built within the rock of Rocher-de-Naye Mountain.

On the other end of the mountain is a model saw mill based on the mill at the town of Nax (Valais) with a water wheel as prime mover powering a reciprocating saw in the mill, all modelled in $^1/_{10}$ scale. In front of the mountain at track level is a Restaurant/Snack bar, the area has a large paved terrace with tables and chairs cabable of seating 120 people. The actual servery is cleverly concealed under the mountain and is accessed by patrons through tunnel portals.



This nicely finished RhB 2-4-4-2 Mallet belongs to one of the members



The Freddy Grimm *suspension bridge (28), a 1/20 scale replica of the George Washington Bridge, is 50m long and weighs 11 tonnes. The prototype is in New York.*

The prototype Brünig Railway system

A first for both! Angel's rack loco is modelled on the Brunig Railway system, both a first for Switzerland. Lucerne is a junction of both standard and narrow gauge lines. From here the Brünig line starts the only narrow-gauge line of the Swiss Federal Railways. It is built as a combined adhesion and rack railway (the first in Switzerland). The line links Lucerne with the Bernese Oberland and the Montreux-Oberland Bernois Railway and it is known as the "Golden Pass of Switzerland" route.

In Alpnachstad the Brünig Railway meets the Pilatus Railway. Interlaken is a junction of the Bernese Oberland Railways (BOB). In Meiringen it is connected with the Meiringen-Innertkirchen Railway, including the Brienz Rothorn Railway and the LSE, the network being 188 km long.

The railway was built in 1888, when it linked Brienz with Alpnachstad, and in 1889 it was extended to Lucerne. The next extension was in 1913, where the Brienz-Interlaken "Lake Line" was built. In 1941-42 it was electrified with the same power system as the standard network of the SBB. The line runs from Lucerne over Alpnachstad to Giswil, where the rack part of the line starts.

Between Giswil and Brünig-Hasliberg the line climbs uphill to 1200m, then it drops down to Meiringen at the center of the railway. From Meiringen to Interlaken it runs along Lake Brienz. In Interlaken station it meets the BOB and provides the connection to the "Top of Europe", the Jungfraujoch (the highest Mountain in Europe).

Conclusion

I hope you enjoyed a short tour of a very special steam park. If you ever get to Europe, try not to miss out on a visit to the Swiss Vapeur Parc. If you have access to the Internet you can see more information on http://www.swissvapeur.ch You can also write to them at: Swiss Vapeur Parc, CH-1897 Le Bouveret, Switzerland, or telephone: 024/ 481 44 10, fax: 024/ 481 54 70

On Sunday, Sue and I travelled to Interlaken for a ride on the JungfrauBahn system. We took a narrow gauge rack railway ride along seven kilometres that took us 2000 metres up the side of a mountain to Schynige Platte! It topped off a great weekend that was part of a seven-week vacation in the area of Southern Germany.

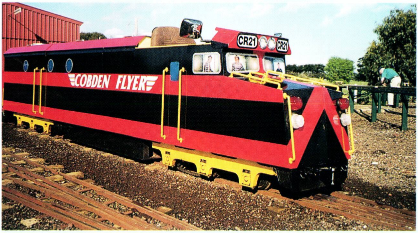
Locomotives of the Swiss Vapeur Parc

Model	Manufacturer	Prototype	Scale
Ge (non-steam)	Ball & Sohn (1989)	Furka Oberalp Bahn	1/4
BDeh (non-steam)	Gachnang Claude (1991)	Bex Villars Bretaye	1/4
BDeh (non-steam)	Gachnang Claude (1992)	Aigle-Leysin	1/4
Ge 8001 (non-steam)	Railway-shop MOB and Gachnang Claude (1994)	Montreux Oberland-Bernois	1/4
Mecklenbourg G (non-steam)	Ball & Sohn (1991)	German railway, narrow gauge	1/3
Mölm G 2-4-0 No.943 (steam)	Ball & Sohn		1/3
Decauville 0-6-0 Stuart No.3014(steam)	J.-Cl. Porterie, Biarritz	LNER	1/3
G 0-6-0 Waldenburg No.5 (steam)		Waldenburg Bahn	1/3
G 2-6-0 (steam)	Gachnang Claude	Sandy River Railroad	1/4
Mallet 2-6-0 + 0-6-2 (steam)	H. Sinclair	California Western	1/4

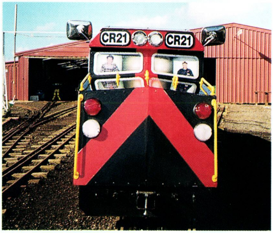
*All locomotives are 7$^1/_4$" gauge

The Cobden Flyer

Story and photos by Ron May



Resplendent in 'Bombers" red and black, the Cobden Flyer *is ready to go.*

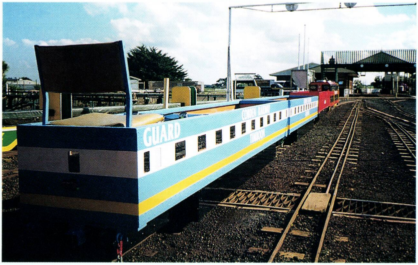


Note the use of photos to create a realistic crew.

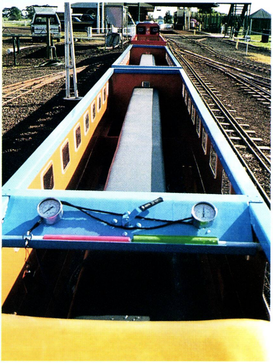
When I moved to Cobden from Melbourne and joined the South Western Model Engineers, I seemed to take a new direction in life from my previously very busy schedule, working full time and with heavy involvement at Diamond Valley Railway. Through various circumstances, I had landed in a small Victorian country town where, unfortunately, no gainful employment was to be found despite many hours of fruitless searching! Fortunately though there was a wonderful little miniature railway in it's infancy and a great bunch of members from Rotary and the South Western Model Engineers making it grow at a fantastic rate! Of course many readers would have read in these pages of the 1997 AALS Convention which was dubbed as one of the best ever and a first for a small country town of just some 1,450 inhabitants! Seeing all the wonderful rolling stock that visited us had my mind ticking over right there and then — no good moping around, out of work and nothing to do! If these guys can make things, why shouldn't I have a go too!

Having never taken model engineering seriously (I prefer to call it miniature engineering) other than being one of the guys that likes to build and operate signals, as well as doing my bit in track work, points, maintenance and building works, I decided it was high time I built the 'big one'. Of course I was lucky enough to have built my little MR12 (affectionately known as the "Butter/Battery Box") a nondescript battery, later converted motorised hydrostatic shunting locomotive which did quite well hauling two passenger carriages around for some time. MR12 was supplemented with a VR type ZL guard's van as RM12's 'bum truck' as well as three green and gold gondola type carriages. This was again supplemented with the very lucky purchase of my current steam locomotive *Oakstream*, a beautiful 2-8-2 *Caribou*. What happened with *Oakstream* thereafter was a huge saga in itself to get it running and acceptable for AALS affiliated tracks! However that is now water under the bridge and suffice to say, *Oakstream* and owner are now enjoying many happy hours of passenger running wherever we go! However I was still unsatisfied. I had yet to build my 'masterpiece'. Many articles and features read from cover to cover in *AME* whetted my appetite.

Many model engineers had described how they had nothing when they started, as well as little expertise or machinery to do the construction — a spitting image of my own situation. Well, as luck would have it, a very good friend from Penfield in South Australia was in the same situation as me — being out of work and a family to raise. He was building an Australian National DL class locomotive. He had the



The guard has a comfortable chair, high enough to see the length of the train.

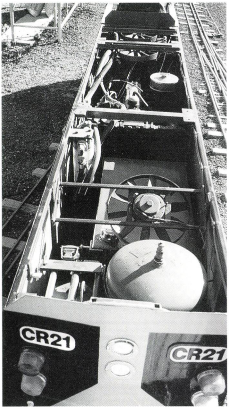


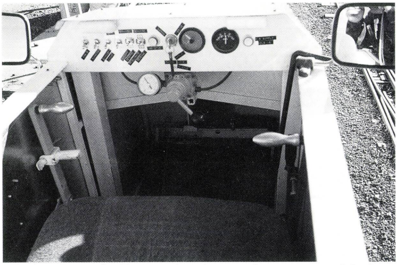
The guard's control panel complete with rolled flags bogies almost built, a bottom frame sitting on top of them, a very comfortable "bus driver's seat" mounted on the frame to ensure, as he put it, the best comfort for the driver, and a beautifully restored Holden 173 motor mounted in the centre, complete with a specially turned up shaft, installed in lieu of the discarded clutch and gearbox assembly for a hydraulic pump. This was as far as my friend had got before financial troubles hit home hard and reluctantly he was forced to sell. Like all true AALS activities which bring many of us together to assist each other, my friend was very fussy about whom he would sell his pride and joy to and he approached me to buy it. This was the beginning of my "masterpiece" unfolding before me. Photographs and a visual inspection of a very well constructed locomotive convinced me to borrow a 12-foot trailer to make the trek to Penfield and bring 'it' back to the Cobden 'Railway House Workshops' in Curdie Street. (The 2nd such establishment, John Wiggins being the 1st and Allan MacCaskill making up a magnificent 3rd establishment — all within a few houses of each other).

From there on work started with great gusto to say the least. The true spirit of the model engineering fraternity was emerging as everyone, including my neighbours all gave me inspiration to push my dream project along at a great pace. The two 6-wheel bogies were removed and the hydraulic motors were completed to the frames and all chained up along with air brake rigging, cylinders and shoes and reinstalled. The body frame was constructed and welded together out of heavy $^{3}/_{4}$" square RHS. The nose and rear end were constructed from 16 gauge mild steel sheet. Provision was made to have removable panels for the roof and one side. The pump was centred and anchored to the motor and under-frame using the ingenious invention of the universal joint. The forward and reverse valve was fitted and an extended control installed inside the driver's cabin as was the throttle, both made to incorporate the 'dead mans handle' theory. The electrical 12V battery was installed behind the driver's seat and the other end saw the installation of the air brakes receiver, a 20 litre ventilated petrol tank made out of a jerry can as well as a 35 litre (ex steam locomotive tender) tank installed as a hydraulic oil reservoir. A modified water radiator and fan was attached to the Holden motor and the twin extractor exhaust pipe was extended with 2" copper tubing, made as long as possible, with previously installed 12" long very heavy springs silver soldered in place inside the tubing to muffle the motor so it would make a sound like a diesel motor but not quite eliminating that unmistakable growl of a Holden.

I was learning plenty with the able assistance of my neighbours and fellow engineers as the electrical wiring commenced, mostly by myself copying the circuitry of my Holden one-ton truck. Three extra cooling fans were installed over the motor and oil reservoir. Four sets of 50 watt down-light globe headlights were installed front and back along with road number lights, marker lights, red tail lights and completed with cabin lights made out of licence plate lights to shield the driver from any reflection during night running. An air pump was installed and belt driven from pulleys on the special shaft made by my friend whereupon all air lines were then installed to all brakes, air reservoir and AALS standard hose couplings, using separate 'stored air' and 'brake line' piping systems for the carriages. An ex garage hoist valve was commissioned in the driver's cabin for brake application that works very well. Being totally ignorant of how a hydraulic system works, various opinions were solicited from all and sundry and I went along with the local expert who's paper sketch was plumbed in by my daughter's boyfriend — a sterling job that was 100% successful and no leaks. The *Cobden Flyer's* innards were now complete and the locomotive was jacked up on blocks for a dry run. After some friendly persuasion, the Flyer burst into life and all appeared to be running splendidly. Not bad for an infant engineer who still can't fix his own car.

Next came the body work which was folded up out of 2mm aluminium sheeting (to cut down on weight) and after some 2,000 pop rivets it was starting to look like a real locomotive. As the AN colour scheme of green and gold was already taken by a resident EL, I decided to be patriotic to my favourite footy team. The famous red and black of the "Mighty Bombers" and coincidentally the local team was all hand painted on by myself using four coats for each application taking over a month of every day-painting to complete. I decided to fill in the driver's cabin windows with snapshots of Cobden's recent Honorary Life Membership recipients John Wiggins and John Riches which seem to stand out well although "Wiggo" wasn't too happy with his pose. My new 'dream' was complete and ready to roll.


the business end of the Flyer *minus its cover*

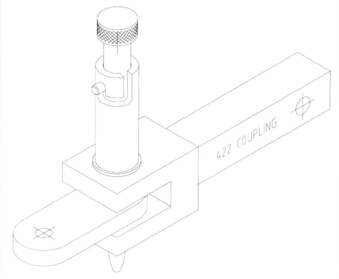

The driver's controls. Note rear view mirrors to observe passenger behaviour

Without going into too much detail the *Cobden Flyer* was weighed at the Bonlac Weighbridge showing 1.080 tonnes of locomotive measuring 14' 3$^{1}/_{2}$" between coupling pins, 2' wide and 3' 1" high from rail level and then unloaded on Cobden's excellent traverser and turntable which only just accommodated the 'big one'. Did it run all right you may well ask? Well, like all model engineers who are novices and sometimes never learn, the bogie springs were too light and needed replacement with specially made heavier ones. A tune-up was carried out after New Year's Eve. A better air pump replaced the one that 'packed it in'. Lack of a resistor on the coil circuit blew it up necessitating a brand new coil. Not bad and it is running well considering that the whole thing was built by a novice albeit with lots of help and that enshrines the 'spirit of model engineering' fraternity.

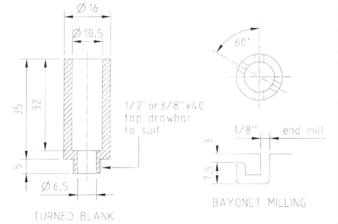
“Bayonet Pin” Type Safety Coupling

by Peter Johnson

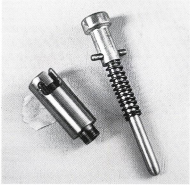
Drawings for publication from author’s originals by Clive Harnwell

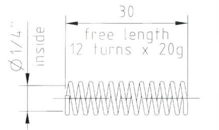


BAYONET PIN COUPLING

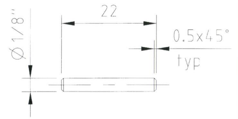


BODY
Bright steel



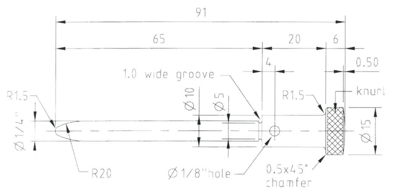


SPRING

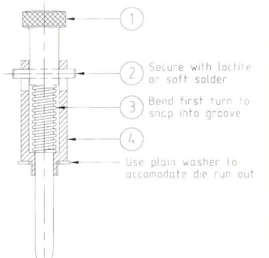


LOCKING PEG
Bright steel

I used this coupling on my “look-a-like” NSW 422 class locomotive. The drawings are self explanatory and should not present any problems for the average modeller



DRAWBAR PIN
Mild steel


1
2
Secure with loctite or soft solder
3
Bend first turn to snap into groove
4
Use plain washer to accomodate die run out

DRAWBAR BAYONET PIN
Assembly

Steam Chest

with Dave Harper

Hi there, steam fans, and welcome to another collection of steam news. The response to the pictures of the Massey hammer in the July/August issue has been little short of amazing. There must have been a lot of these hammers around, and it seems there still are a few in use in restoration workshops around the place. I'd like to thank all those readers who responded, and have done so individually I think.

The Massey hammer explained

One very gratifying response came from Joe Carroll from faraway Vancouver, Canada. Joe sent me photocopies from his apprenticeship textbook of 50 years ago! **Figures 1 and 2** are from *Workshop Technology, Vol 1* by W A J Chapman published by Edward Arnold in London in 1953. To supplement the diagrams the description is as follows:

'The diagram shows a Massey 5cwt pneumatic hammer. Air is compressed on both upward and downward strokes of the piston on the right, and the method of feeding this air to the ram cylinder is controlled by the long valve between the cylinders, the valve being moved by the control lever.

When the lever is in the 'neutral' position as shown, the spaces above and below the pump piston are open to the atmosphere, so that the pump reciprocates idly and the ram piston rests at the bottom of its stroke with the top pallet resting on the anvil. Depressing the lever lifts the valve from its neutral position, closes the openings to atmosphere, and connects the spaces above and below the pump piston with corresponding spaces above and below the hammer piston until eventually, with the valve in its highest position for 'full work', the hammer piston lifts as the pump piston descends, and vice versa (full stroke automatic blows).

If the control lever is raised to its full extent from the neutral position, the valve is lowered, the upper part of the hammer cylinder is opened to atmosphere and the lower part connected to the air reservoir. This lifts the ram to the top of its stroke and holds it there (hold up). Raising the lever a little above the neutral position reverses this condition and holds the hammer down (hold down).

Single blows may be obtained by moving the hammer from the 'hold up' position to the 'hold down' positions, the force of the blow depending on the speed and extent of the movement.

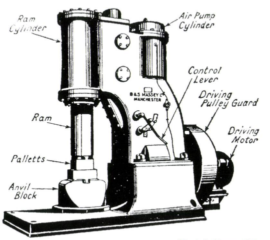
On the Massey 'Clear Space' hammers the strokes vary from 14 ins on the 2 cwt to 42ins on the 40cwt size, and the speed from 200 to 85 blows per minute for the same range of hammer sizes.'

Well, that solves the mystery of how the hammer operates — many thanks for that, Joe! Now, who will be the first to make a model Massey hammer?

Maudsley valve gear

I had a request some time ago for details of the Maudsley valve gear, as used on the marine engines by that manufacturer way back in the 1850s, and still, apparently used on the occasional model marine engine. A response came from regular correspondent Dave Merrifield of NSW, who sent me a copy of the figures shown in **figures 3,4 and 5**, from his 1885 edition of *The Marine Steam Engine* by R Sennett RN, published by Longmans, Green.

The description goes like this: *'In some cases the slide valves have been placed on the tops of the cylinders and worked by means of a small crank-shaft, driven by the engine crank-shaft, through the interposition of cogged wheels....in this arrangement, spur wheels are fitted on the main and slide-valve crank-shafts, and are connected by two additional wheels, carried by a bar working in suitable guides at its two ends, to keep the wheels constantly in gear with each other, as the bar is raised or lowered. By altering the position of this bar, the slide-valve crank is turned, and consequently the position of the slide-valve, relative to the crank is altered. All the expansion in these engines is done by the slide-valve, no special expansion valve being fitted. The slide-valve has three ports for the admission of steam, as shown in (**figure 5**), to facilitate early and sharp cut-off.*



[B. & S. Massey Ltd.

FIG. 75.—Massey 5-cwt. Pneumatic Hammer ("Clear Space" Type).

Figure 1

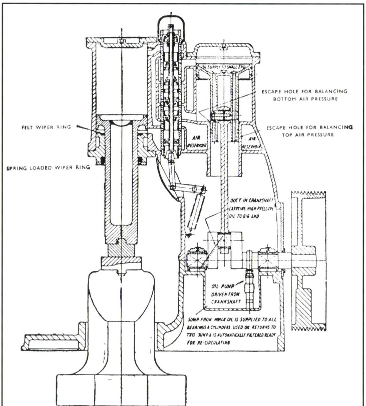

OIL SUPPLY TO SMALL END
ESCAPE HOLE FOR BALANCING BOTTOM AIR PRESSURE
ESCAPE HOLE FOR BALANCING TOP AIR PRESSURE
FELT WIPER RING
AIR RESERVOIR
AIR RESERVOIR
SPRING LOADED WIPER RING
DUCT IN CRANKSHAFT CARRYING HIGH PRESSURE OIL TO BIG END
OIL PUMP DRIVEN FROM CRANKSHAFT
SUMP FROM WHICH OIL IS SUPPLIED TO ALL BEARINGS & CYLINDERS. USED OIL RETURNS TO THIS SUMP & IS AUTOMATICALLY FILTERED READY FOR RE-CIRCULATING

FIG. 76.—Sectional View of 5-cwt. Hammer.

Figure 2

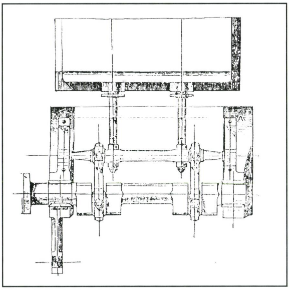


Figure 3

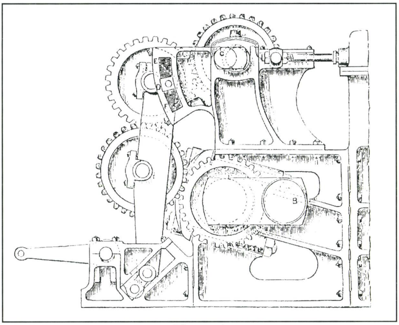


Figure 4

For working full speed ahead, the bar is raised so as to bring the block D to the position K at the top of the slot, and for full speed astern it is lowered to the position marked F. When the block is at intermediate positions in the slot, the engines are worked expansively.

*For setting the slide-valve crank-shaft, when the wheels are out of gear, the engine crank should be placed on one dead centre, and the slide crank on the opposite centre, as shown at B and C in (**figure 4**). The position of the spur wheel frame should then be adjusted so as to bring the upper guide block to the centre of the curved slot, as shown at D, when the wheels may be put in gear. The teeth of the wheels are numbered, so that if taken out of gear at any time, they may be readily replaced in a correct position, by taking care that the teeth marked with the same numbers work together.'*

Many thanks for that, Dave. It looks like quite a simple, usable system for a model engine, and that description should be enough to set any potential modeller on the right path!

Under-type engines at Tamworth

The picture of the under-type engines in the May/June issue prompted another regular friend of this column, Dave Muddiman, also of NSW, to tell me about the similar units in the Tamworth Powerstation Museum. Apparently Tamworth was the first municipality to install electric street lighting in Australia, turning on the lights on 9th Nov 1888.

The Peel-Cunningham County Council and Tamworth City Council opened the museum to celebrate the centenary of this event, in 1988. The original under-type engines and their generators were long gone, but two similar engine units and boilers were acquired and replicas of the original generators were built by the Council's workshops.

On the evening of the centenary the replacement units were fired up, and four replicas of the original 3,000 candlepower carbon arc lights lit up the new Bicentennial Gardens, on the site of the original Oval sports ground.

Dave kindly sent me a leaflet and a book (*City of Light* by I R Lobsey, published 1988 by Peel-Cunningham County Council) which tell the whole story. Now there's a set-up worthy of modelling! I'm sure anyone interested would be welcomed at the museum in Tamworth. I imagine copies of the book and leaflet would be available from the Tamworth City Council, PO Box 555, Tamworth, NSW 2340.

Thanks for your trouble in providing that information, Dave. Do you know of anyone building a model of the setup?

Dutch Steam Museum

Another welcome package I received recently was from Tim de Haan of Victoria, who sent me a copy of the guidebook of the Dutch Steam Museum which he discovered on a recent trip to Holland. Tim also included a lot of photos that he took of steam engines in the museum, and I'm reproducing a couple of them here.

Photo 1 is of a very nice single cylinder, piston valve engine built by Stork in 1919. It was originally used in a dairy, but was

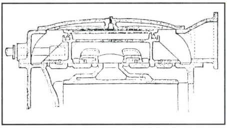


Figure 5

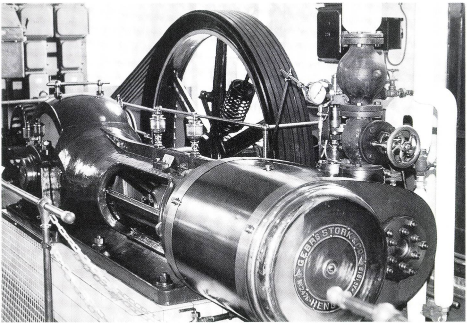


Photo 1

later fitted up to drive a generator, which it still does in the museum. The cylinder is 300mm bore x 500mm stroke and puts out 125hp at 160rpm.

Photo 2 is of a 1931 Burgerhout compound marine engine from the bucket dredge De Hoop. With cylinders of 225 and 450mm bore x 280mm stroke, it gave 120hp at 200 rpm.

These are only two of the many working engines in this excellent museum. The building housing the museum started life in 1869 as a pumping station of the Waterschap 'Vier Noorder Koggen', helping reclaim land from the sea, a long-time occupation in that low-lying country!

A concurrent exhibition is 'West-Friesland above Water', which tells the story of the area and the control of water levels by the pumping station.

It sounds like a place well worth a visit by anyone doing the European tour. Many thanks, Tim, for the loan of your book and photos!

Feedback on traction engines

The drawing of the odd-looking traction engine in the July/August issue prompted another reader, who prefers to remain anonymous, to send me copies from the book *Encyclopaedia of American Traction Engines* by J Norbeck, published by Crestline.

These show that the engine in question was a Champion Road Locomotive built by D June and Co. of Fremont, Ohio. They made a range of these machines, which, although looking odd to us now, were clearly very practical in their day.

The vertical boiler was apparently favoured as it was less vulnerable to priming etc when used in hilly country. The bulbous chimney was their patent self-acting spark arrester, no doubt a valuable accessory at harvest time! The cylinder under the engine is indeed a water tank, and held about four barrels of water. Drive was via a friction clutch arrangement inside the drive pulley, thence by gears and chain to the rear wheels. Thus the drive could immediately be disconnected from the wheels if neccessary. It also made it easy to set up as a stationary engine for powering thrashers etc.

To quote from the book: '*the June steam traction engines had the first spark arrester in the United States. The upright boilers never exposed the crown sheet and the flues would last much longer than in a horizontal boiler. Using cold water they would get up steam in about 20 minutes. The Champion engine was patented in 1875, 1876 and 1877.*'

Well, it would certainly make a different looking model!

An imperial gift!

This same correspondent completely floored me by sending me, as a gift, a wonderful old book called *The Imperial Journal of Art, Science, Mechanics and Engineering*, published c1885! This volume landed with a resounding thump on my front doorstep, courtesy of Australia Post, and kept me quiet all day!

After some study, we (my wife Sandy and I) decided that the original must have been published in weekly parts, each of about 32 pages. The contents are arranged in recurring chapters, much like the *Arthur Mee's Children's Encyclopaedia* that I grew up with. It looks as though someone discovered an incomplete set of these Journals and had them bound, a long time ago! We decided this because there is no title on the outer binding at all, and there are gaps in the page sequence. It also starts with Vol II and goes into part of Vol III.

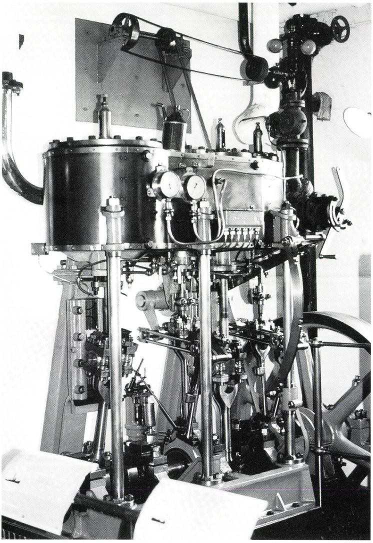


Photo 2

Despite this, it is a fascinating book, covering all the subjects in the title, including many items on steam engines and machinery of the era. There were also a number of fold-out drawings which were literally disintegrating. The only way I could think of salvaging these was to cut them from the book and stick them onto sheets of tracing paper. I was then able to get them photocopied, so we have a record of these fascinating drawings. I also went through the book and copied all the articles that seemed to be of interest, so that I can share them with you.

After some rationalising of the big drawings, by copying them onto two A3 sheets for economy, I ended up with 16 A3 sheets, and 51 A4s! The A4s have been split into two sets, 24 of machinery and 26 of steam engines. One sheet ended up not needed!

The reason for splitting the A4s is

Available drawings

Set 1:	Approx 40 A3 sheets of engravings from *The Engineer* magazine of 1867. Mailed in a tube for $10.
Set 2	36 sheets of stationary engines etc.
Set 3	25 sheets of boilers and machinery.
Set 4	37 sheets of locos, traction engines, portables etc.
	Sets 2 - 4 are sheets from the *Paris Exhibition Catalogue of 1878.* 3 packs of A4 sheets. A $4.90 book of stamps for each set.
Set 5	The Allan Wilson drawings. 74 A4 sheets of notes and drawings from an old engineering textbook. Fully dimensioned drawings of small steam engines, loco valve gear, pumps, governors, hydraulic machines etc. Mailed in two packs for 2 x $4.90 books of stamps or $10 cash or cheque.
Set 6	The *Imperial Journal* drawings of steam engines etc. mentioned above. 26 sheets for a book of stamps.
Set 7	The machinery sheets from the *Imperial Journal* — 24 sheets of machinery for a book of stamps.
Set 8	The 16 A3 sheets from the *Imperial Journal,* folded flat for a book of stamps.

economy of mailing - as soon as the weight goes over 500gms it becomes a parcel and costs heaps!

The machinery parts have some fascinating stuff for any student of old machinery - like several pages on the chucks of Holtzapffel's lathes and Whitworth's self-acting machines. The steam engines cover numerous engines including Penn's trunk engine and a high pressure blowing engine. The big sheets have drawings of several early paddle engines including a side lever engine and what I think is now called a Siamese engine. The whole set would have to mailed in a tube, and I don't know what that would cost at present. The A4s would be available for my usual fee of a book of stamps each, but see the next item.

You, me, and the GST

Although the standard 45c stamp is still used for normal letters, Australia Post have imposed the GST on large envelopes, and stamps are now 49c each! These come in books of 10 for $4.90, so I'd ask anyone sending for photocopies to please send me the $4.90 books of stamps!

I thought it as well this time to recap on the sets of drawings that have become available over the past months, my filing cabinet is starting to bulge at the seams!

If you want any combination of these drawings(see previous page), give me a ring, drop me a line or an email, and we'll work something out!

As you will hopefully have noted, I'm not out to make money from these packs, but I love to share them around so long as I cover my costs! I have a heap more files of old material, an SAE will get you a list of them if you're interested.

The winch works!

Finally, I have to let you see a couple of photos of the model steam winch, now all complete and running on air every Sunday at Petrie! **Photos 3 and 4** are it! The base is about 6 inches square and the frame about 7 inches high to give a scale to the pictures.

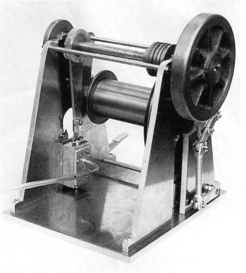


Photo 3

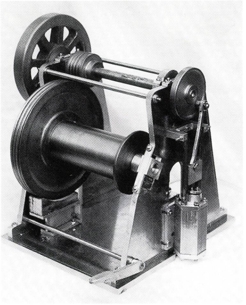


Photo 4

I'd hoped to make the whole thing using metric dimensions, but came horribly unstuck using imperial and metric materials and fasteners quite indiscriminately because that's what I had to hand! I'll get around to telling the whole story sometime, but it's been a terrific learning experience - my first steam engine, first bit of solid model engineering, and I had to design the whole thing from scratch! A most instructive three months' work, I reckon.

Incidentally, I was up at the Jondaryan Woolshed recently, and spotted an old truck-mounted crane with an identical friction drive system on it! It had a big lever that the operator pulled to lift and pushed to brake, held half way and the load would come crashing down!

That's all for now, till next time, happy steaming!

You can email Dave at:
sandave@bytesite.com.au

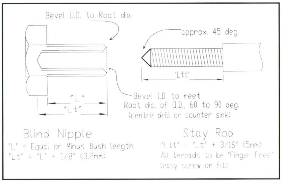
Longitudinal Stays

by Barry Glover

Drawing for publication by Kent Learned

I always reckon the worst part of building copper boilers is the fitting of longitudinal stays.

The AMBSC Boiler Code shows a couple of different ways to fit these, but in my opinion the only way is by the bush and blind nipple method. The drawback with this however, is that we never have a long enough tap to ensure continuation of thread in the bushes, etc. There is also the problem of ensuring the lining up of the bush at each end.


Bevel O.D. to Root dia.
approx. 45 deg.
'Ltt'
"L"
"Lt"
Bevel I.D. to meet
Root dia. of O.D., 60 to 90 deg.
(centre drill or counter sink)
Blind Nipple
"L" = Equal or Minus Bush length
"Lt" = "L" + 1/8" (3.2mm)
Stay Rod
"Ltt" = "Lt" + 3/16" (5mm)
All threads to be "Finger Free"
(easy screw on fit)

Another fly in the ointment is that no matter how carefully we bolt, rivet or set up the various plates in the boiler, when we have finally glued it all together, distortion throws it all out of line.

To overcome all these problems, if they occur, I use the following methods:

1. Machine up a mandrel approx. 6" long with one end machined and threaded to suit the bush. Thread length to be at least $\frac{1}{16}$" longer then bush length and diameter of mandrel to be equal to bush flange diameter. (Refer to Bush Table in Boiler Code Part 1.)
2. After tapping out bushes, screw in mandrel and sight squareness to boiler centreline. With a hammer, knock the mandrel square by eye and tighten after each blow. Repeat for opposite number. Run through the appropriate tap.
3. Machine the required number of blind nipples so that the thread is a "finger fit" in the bush. (See drawings for details of nipples)
4. Cut stay rods to approx. length and screw one end to suit nipple. Smear with "Never Seze" or similar and screw up tight one nipple.
5. To guide the stay rod through the other end, get a piece of tube, e.g. $\frac{5}{16}$" dia to suit $\frac{3}{8}$" x 40-32 bush. Drill one end $\frac{1}{4}$" x $\frac{1}{2}$" deep, push through bush at one end, put stay in from other end and insert in tube under dome opening. Guide through and screw in nipple, check length of rod, cut and screw as per drawing.
6. Put the 'anti-seize' on the stay rod, some tape and seating paste on the nipples, join up as before, screw in and with a socket or similar each end, wind it all together. You should now have a perfectly tensioned stay.

It is all a case of feel — copper bushes do give a little to line up the threads. Number each stay so if they have to come out again they go back in the same place. Remember, if after all this hard work you have a leak that requires re-heating the boiler, remove all the long stays, otherwise they will quickly become in the semi-hard condition and I believe useless.

Simple Mini Update

Story, drawings and photos by Steve Reeves

A few years ago, AME published a series of articles by me called *Simple Mini & Mini Deluxe.* It was based around a simple oscillating engine on a stand, complete with a spirit fired vertical boiler. This design proved popular.

On Saturdays I invite people into the workshop, people starting out in the hobby who have not yet gained skills and workshop equipment. So I teach them. At the beginning of the year a 13 year old boy named David Balaam came over and started on *Simple Mini.* Four months later he produced the result shown in the photographs. Not a bad effort.

As can be seen, his standard of workmanship and finish is very good. Dave showed his metalwork teacher at school, who was so impressed that he took a photocopy of my original draft drawing. Dave is now saving up for a lathe big enough to build a simple 5" gauge engine. His father is sponsoring the project. Good for Dave. Well done.

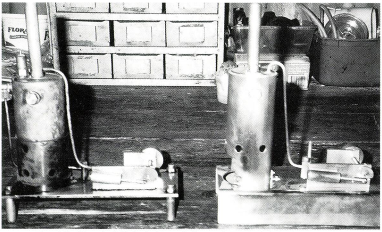
A modification

The original *Simple Mini* has the fire cup sitting on the base inside the boiler cutout. This is how Dave's engine was set up and although the boiler would steam, it did not do as well as my *Mini Deluxe.* So Dave's engine unit was modified to have the same set up as *Mini Deluxe.* I have included drawings which show the new arrangement. As can be seen, a hole has been cut in the base directly below the boiler and the fire cup now sits under the baseplate.

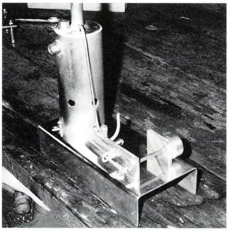
Tip: the engine unit would look good sitting on a nice wooden base, and this will also stop heat from the fire cup burning anything it may be sitting on.

For those who missed the original series (*AME* issues 12, 15, 18, 22, 25, 28, 33, 35, and 39) I have redone all the drawings and they are now available direct from me (see classified ads on page 65).

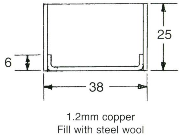
So there you have it — a project for the young generation, and as Dave has shown, it can be done.



David's Simple Mini *(left) and the author's* Mini Deluxe *(right)*

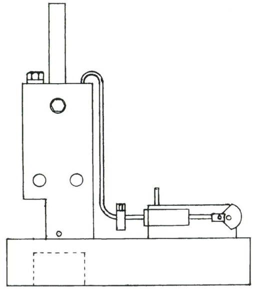


Another view of David's engine

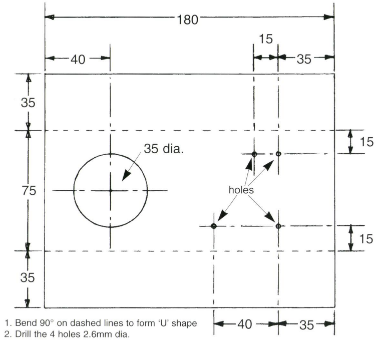


1.2mm copper
Fill with steel wool

Fire Cup



Side View



1. Bend 90° on dashed lines to form 'U' shape
2. Drill the 4 holes 2.6mm dia.

Base Plate

1.2mm thick brass sheet

Shape Memory Effect

Silent Motorless Electrical Motion

by Ian Sherb

Being first discovered in 1932 Shape Memory Alloys (SMA) were always a "hot property" of military and scientific research organizations. Expensive and very hard to find — up until recently, these materials were not accessible to the general public and therefore were practically not explored by hobbyists and enthusiasts.

As research continued over decades — by 1963 first expensive and toxic Gold-Cadmium alloy was replaced by cheaper, non-toxic and more efficient Nickel-Titanium Alloy. During 1969 - 1973 researchers also found Shape Memory Effect in other alloys such as: copper-zinc, copper-tin, copper-zinc-aluminiunium, iron-platinum, and manganese-copper.

Of these, two particular alloys were chosen for their efficiency and relative low cost, these are Nickel-Titanium and Copper-Zinc-Aluminium.

Over the last 30 years SM Alloys have found their uses in areas like medicine, robotics, space and other hi-tech industries.

What are Shape Memory Alloys (SMAs) ?

SMAs are the alloys that have a uniform crystal structure that changes radically with a change of temperature. This process can be repetitive and reversible and depends on temperature.

If we take a peace of raw Ni-Ti alloy wire below it's transition temperature and deform it by stretching it up-to 5 or 8 % we will literally have a WireMuscle which, when heated with electrical current, will contract by up-to 4,5 % of it's length and excrete a considerable force while doing so. When heating is stopped the "WireMuscle" will instantly return to its stretched state, ready for another action.

Today SM Alloys are becoming accessible for hobbyists and home experimenters to experiment with. This opens up many exiting possibilities for enthusiasts.

A whole new range of actuators and movement devices are possible with this technology. As example a small piece of wire 0.1mm in diameter will easily pull a weight of 150 gram when powered from 2 x AA batteries at about 200 miliamps.

Recently a range of SMA products for hobbyists have been on display at the HOBBY FAIR in Melbourne. By the way, — next fair is scheduled for 17th of February 2001 at 8 Chapel St, St.Kilda and promises to be very interesting.

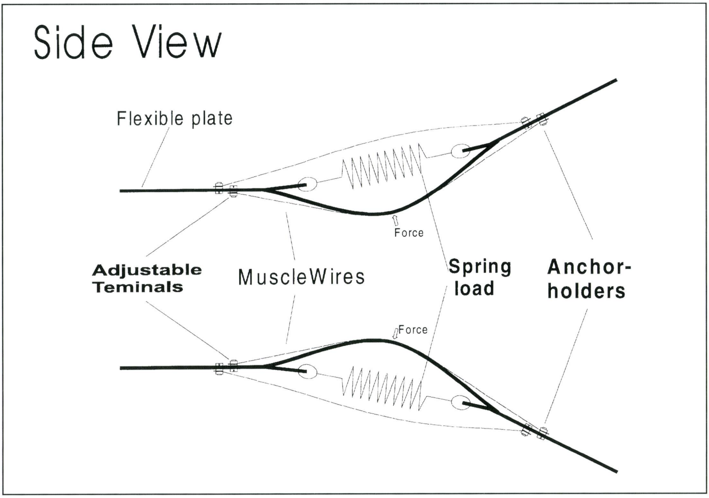
Here are some interesting project ideas using SM Effect for those who would like to experiment with SMA technology:

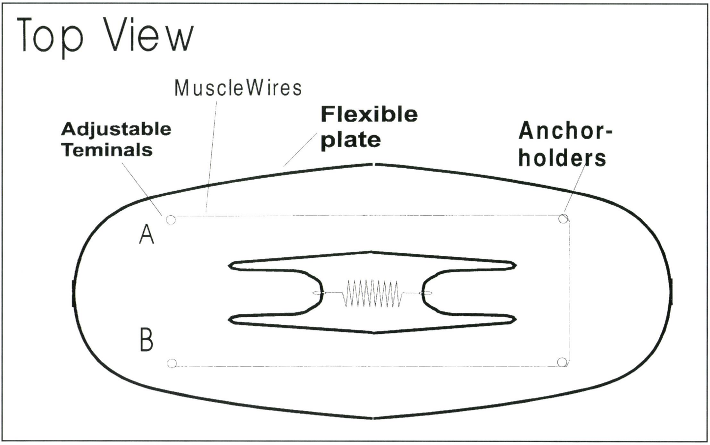
Wing Flap Actuator

MuscleWires allow one to build very lightweight and if needed, miniature actuators for use in model airplanes as alternative to conventional servo's.

This is one simple design worth looking at. Basically it presents a "Momentary Action Trigger Mechanism" made up by strong but flexible plastic or aluminium plate and a spring load. This mechanism is fitted with two identical sets of MuscleWire, one on top and another at the bottom.

When the bottom wire is activated, it contracts and pushes the middle "bridge"





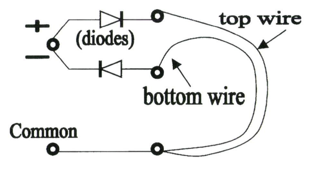


Diagram 1

part of the mechanism inwards, which in turn, triggers the mechanism to flip into the opposite position and so changes the position of the flap it is connected to. The same thing will happen again but in opposite direction if now the top wire is activated.

Utilizing "Momentary Action Trigger Mechanism" makes possible a very economical mode of operation since the MuscleWires has to be powered up only for short periods of time — just enough for triggering the "flipping mechanism"

The electrical current is applied to the terminals across the active length of wire. the amount of electrical power needed to activate the mechanism would depend on a particular design. But I would say it would generally be between 0.2 - 0.8 Watt and between 0.5 and 1.5 seconds in length. Care should be taken not to continuously overheat the wire with excessive current. For 0.1mm NiTinol wire linear resistance would be 150 Ohm per metre length and the recommended current 180 milliamps.

Obviously in this simplified design only two positions are possible, however it is easy to improve this design so that flipping action will be accompanied by further controlled rising or lowering of the flap. This can be achieved if instead of conventional steel spring we will use a SMA spring which would be able to contract with electrical signal and further change the angle of the flap.

If your on-board RC receiver has outputs with reversible polarity then simple 2 diode splitter will allow you to run both MuscleWires from the same channel. In that case signals of opposite polarity will activate opposite wires. **See diagram 1**.

When tuning this actuator to the optimum performance it is important to be able to change the active length of the MuscleWire by adjusting it at terminals.

Anchor-holders should just hold the wire loosely and allow it to slide through.

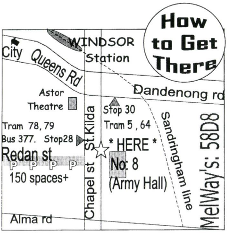
When working with SMA wires keep it free of sharp bends and corners As a general rule — don't bend a wire around a radius smaller than 50 times it's diameter, for example 0.1mm wire could be bent around 5mm radius or 10mm diameter minimum.

When Making such an actuator from scratch it may require quite a bit of experimenting. A piece of MuscleWire 100mm long would usually cost about 3-4 $AU depending on diameter.

SMA materials and products are now available in Australia. A range of prefabricated actuators should also become available within weeks. The place to start would be *Appltech Technologies* in Melbourne (phone (03) 9543-3326).

If you happen to be in Melbourne in February, I recommend you to visit the Hobby Fair in St.Kilda on Chapel Street (see map below) for many more great ideas.

(Ian Sherb is a membeer of the Australian Creative Trands Association in Melboune. Phone (03)9515 9657 or email:
isentz@tpg.com.au*)*



Marker Lights

By Warwick Allison

Drawing for publication by Kent Learned

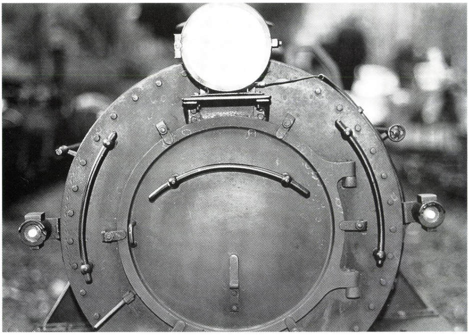
Here are some details of the marker lights I have fitted to my WAGR V class locomotive.

I use 5mm diameter high brightness (600mcd) white LEDs which are available from Jaycar for $6.95 each. They do have a slight blue tinge. The white ones need 3.6v to operate so I use three 'D' cells in series. As this gives 4.5V, a 51 ohm resistor is wired in series with each one. For these, I use 0.5 Watt metalfilm types which are compact. The LEDs are mounted to suit the application for my loco and I am sure most model engineers could devise an arrangement to meet their own needs. I did use the LEDs clips (available in packets of 20) to mount the LEDs on the back of the cab to provide lighting (it looks like fluorescent lighting at night!).

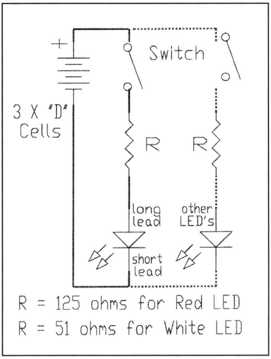
If red LEDs are used for tail lights, the same applies, except that they are 2v types and need a 125 ohm resistor. Red ones are only about $1.95.

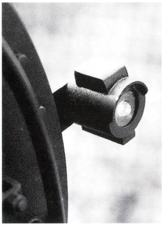
The resistor and LED tails can be poked into some black heatshrink tubing. When shrunk on and the end poked up a conduit, they are very elegant.

As LEDs only consume 20mA, the battery life is considerably extended (this is of course an understatement). The batteries I purchased last November are still going strong after 6 months. I run the markers each running day and they are brilliant, even in full summer bright daylight. They have a big advantage over torch bulbs.

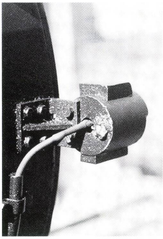


This front view of the author's 5" gauge WAGR V class loco shows both marker lights (plus) headlight and the photo was taken in full sunligh with the flash on. Photo: David Proctor





Above and below: Front and rear views of the marker lights as described. Photos: Brian Carter



Handy Hints

- **Soldering rounded beading** to my V-2 tender body, had some hassles holding it in place till I remembered I had some large split pins bower-birded long ago. Spread slightly and slipped over the work in the appropriate places — quick, easy and efficient.

- **Leaf springs** — springs on my ride-on tenders are made from steel strip used to bundle timber and metal bar stock. This thicker material is usually painted green. Old friend, the late George Shand showed me how to harden and temper this material without special equipment.
  1. Taking each leaf by one end with pliers, heat evenly with gas torch till flame from burning oil fades and drop in cold water.
  2. Cut leaves to width and length and drill any holes needed, roll to desired camber
  3. Heat to bright red and quickly drop in oil bath. Used engine oil works well. The same treatment has been applied to coil springs with success.

- A visitor to my workshop was surprised to see me using a **brass scriber**. Apparently this useful tool is not as well known as I had thought. Just a few inches of 3mm tobin bronze, brought to a sharp point at one end, leaves a clear yellow mark on black steel. The point quickly dulls, but a touch with a file or the belt sander puts that right.

Bob Kimber

Making Splines with a Keyway Broach

An Update by Peter Dawes

Drawing for publication from the author's original by Tim Smith

I introduced broaching, extolling its virtues for cutting keyways in AME Mar/Apr 1998 (issue no 77, p19). It's time for an update.

Due to the fact that "packing strips" or "spacing strips" come in steps of finite thickness it isn't practical to try to broach keyways to precise depths. I make the strips in steps approximately $^{3}/_{32}$", $^{1}/_{16}$", $^{1}/_{32}$", $^{1}/_{64}$". These cover a big range of depths with the minimum number of pieces but the minimum step is $^{1}/_{64}$" (which is about 15 thou or 0.4mm).

The depth of the broached internal keyway should be measured with the internal jaws of a vernier caliper from one side of the bore to the bottom of the keyway. Subtracting the bore diameter gives the effective keyway depth.

The fine adjustment for TOTAL depth is best done at the stage of milling the shaft keyway. That is because we can set the depth of the end mill to any figure we like and very precisely.

Note that half of the key should be in the shaft and half in the bore of the wheel. The depth to cut into the shaft to achieve this for different shaft diameter and with different key widths is not just half the key thickness. It is calculated in the **KeyDepth.Bas** computer program and has been made into a table.

With the digital vertical readout on the mill it is possible to mill depths to a thou (.025mm) with great accuracy, without worrying about backlash, and without the need for calculation. Digital vertical readouts were described in AME issue 5 (Feb 1988) and in issue 74 (Sep-Oct 1997).

Note that the $^{1}/_{64}$" packing strip is so thin that the friction with the back of the broach tends to pull it down into the guide and straighten out the right angle bend. That leads to the first tip:-

Tip 1

Sandwich very thin strips between thicker strips so they will not be pulled out straight. Alternatively, bend the strip over and silver solder it on top of a short piece of thicker steel, say 2-3mm thick. I make my thinnest strip from steel cans.

Keith Wilson has shown packing strips with a Tee shape. The top arm of the tee prevents it from dropping down in the bush but thin ones will still be pulled down into the slot if placed adjacent to the back of the broach. The top of the tee will be ripped off.

Tip 2

Avoid designing for keyways over $^{3}/_{16}$" wide. Wider keyways than this require a whole new set of guide bushes and packing strips because of the new back width and that is a lot of extra work. When it is remembered that all sizes up to $^{3}/_{16}$" have the same size back and can share the same bushes and packing strips, there is good reason to stay at $^{3}/_{16}$" or below.

But there is another reason. The force required to push broaches through steel bores or even through long alloy bores, is surprisingly great. I vaguely recall Tubal Cain or someone calculating it and obtaining figures in the ton range. I find that $^{3}/_{16}$" is about as big as I can manage with my No 3 press even with an extension on the handle.

It is possible in emergencies to push a big broach through by using thin packing strip steps so that the broach is only cutting on the top one or two teeth at each pass. That reduces the force required, but if it is done on a regular basis the top teeth will become blunt and that will spoil the broach for ALL jobs.

Tip 3

To get additional leverage to make long cuts in steel or alloy, or when using wide broaches, screw an extension piece onto the handle. For a No 3 press, a piece of $^{3}/_{4}$" galvanised water pipe makes a good extension when it is threaded internally at one end and screwed onto the handle in place of the chromed end cap. The thread size is $^{7}/_{8}$" NF x 14tpi. Cut the thread in the lathe because if it is tapped it is almost certainly going to end up crooked. On a long length of pipe any bend becomes very noticeable and will even impair the operation of the press. I ruined one piece of pipe trying to tap it by hand.

As to length, the extension should be about 16", and definitely not longer than 18" for a No 3 press or it isn't going to clear the bench top at the bottom of its rotation. As long as it clears the bench top the extension can be left in place permanently.

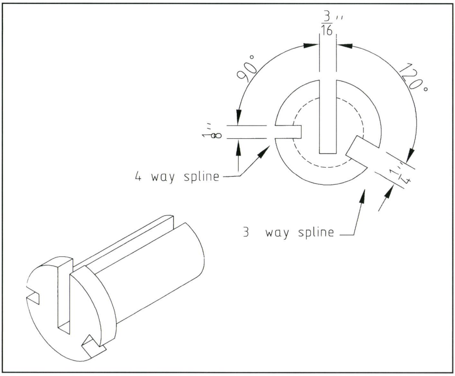
Tip 4

Remove chips from the teeth between passes. They can be so thick as to impair cutting on the next pass, quite apart from possibly jamming the broach.

Tip 5

When making guide bushes, after turning the body diameter of the bush to size and forming the flange, do NOT cut it off from the bar stock until the slot has been milled. It is much easier to hold the whole thing in the milling vise than when it is only an inch or two long. The milling vise should be a so-called precision vise with ground jaws. Setting up a job true in one of these in the vertical plane only requires a parallel of suitable thickness underneath the bar. The vice must of course be set parallel with the table and this is very easy if you have fixed a guide bar into its base to locate it one of the tee slots. This subject was also dealt with in another article.

Centre the cutter on the diameter of the job using the centre finder tool (Starrett and Mitutoyo make them) and



mill the slot with a $^{3}/_{16}$" end mill. It may need to be a deep cut for large broaches so cut it with an end mill in passes about 30 thou or 1mm deep. The feed will depend on the condition of the cutter, so as it gets blunt, reduce the cut or risk breaking the cutter. Always use cutting oil.

Minimum bore diameters

The smallest bore in which it is possible to broach a keyway is determined by the front to back thickness of the broach at its smaller end. I have a $^{1}/_{8}$" broach with $^{3}/_{16}$" back with which I can just get down to half inch bores. I also have a $^{1}/_{8}$" broach with a $^{1}/_{8}$" back that will allow me to get down to $^{1}/_{4}$" bores. But both these require a very deep slot in the guide bush leaving the bottom of the slot with relatively little metal. So when making bushes for small bores it becomes especially important to leave the bush attached to the bar stock while milling the slot or the vise will squeeze the sides and jamthe cutter.

I also have a 3mm broach but cannot buy keysteel for it!

Once the slot is cut, return the bar to the lathe and part it off with the goose neck parting tool. I've even successfully parted a bar across the slot. It's not recommended but it will work. That's how effective goose neck tools can be. (AME issue 64, Jan-Feb 1996).

Making Splines

It's possible to make splines using just a keyway broach, but more than one land requires indexing both guide bush and shaft, whether it be on the mill or in the lathe. It will probably be necessary to make a new guide bush because it will be too difficult to set up an existing bush to cut the extra keyway to the accuracy needed. If they are made with the extra keyways first up, they will do double duty - for the ordinary jobs as well as for splines. Setting up for indexing does add a bit more work to the machining.

Now these splines are the opposite of conventional splines where the grooves are in the bore and the lands are created on the shaft. Here the grooves are in the shaft and the lands in the bore. While it is possible do it the other way round, this is very much easier. It requires less key steel and it works just as well. In fact this way is better in one respect; the spline shaft can rotate in a bush or bearing without the lands having to be removed. It is envisaged that the keyways and lands for all ME work will be $^{1}/_{8}$ x $^{1}/_{8}$".

While a single key could function as a spline it is "unbalanced" and therefore not ideal. Three or four keys are better. To make either of these it is necessary to make a guide bush with an extra keyway milled on the outside at exactly 90 degrees for a four key spline, or at 120 degrees for a three key spline. In fact the bush could be made with both, one on each side. Then it would cater for both 3 and 4-way splines.

The indexing must be accurate so mill it in a dividing head.

So to make the GUIDE BUSH the main slot is milled as usual. Then the bush is rotated accurately in the dividing head the relevant angle and a NORMAL depth and width keyway is milled in it.

It's always possible to fit at least one keyway alongside the guide slot but unless the shaft is a large one, it is not normally possible to add more than one. That is what limits us to 3-way or 4-way splines. Indeed, three or four is plenty anyway. A wide diameter shaft cut with a $^{1}/_{8}$" broach with a $^{1}/_{8}$" back would allow six lands to be accommodated, but I do not see any advantage unless one is making a precision spline shaft for a job where there is going to be hard wear with an interrupted load, and free play must be kept to an absolute minimum. The quality of the final job will depend more on the workmanship than on the number of lands.

The bush or nut

An ordinary thick-walled bronze bush makes a good nut. Broach a keyway in it as normally. Then rotate the GUIDE bush inside it and put a key in the new keyway to lock the two together. This should be a good firm fit. Broach the spline bush again in the new location as for any normal keyway. Repeat these operations to cut the remaining keyways putting a short key in at each step to lock it.

The spline bush is finished off by pressing and/or Loctiting® suitable pieces of keysteel into its 3 or 4 internal keyways.

The spline shaft

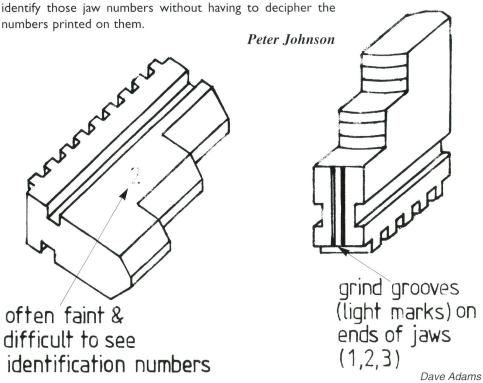
To make the shaft (male spline), mill the keyways in the usual way but accurately in a dividing head. These keyways should be cut a few thou (.03mm) OVERSIZE since we want a sliding fit here rather than a press fit. To get a very good fit it is advisable to lap the spline by means of a short surplus piece of nut. Very long keyways are easier to cut with a slitting saw but that is up to the user to decide. A saw is going to exert a lot more side pressure than an end mill, so that provision for back support is required. Switching from saw to end mill mid-stream is difficult and not recommended, so decide which method you are going to use at the outset.

To mill keyways oversize using the end mill method requires a cutter that is new and sharp. Take very light cuts of a couple of thou only. Run it somewhat faster than the roughing cut. That amount will probably be enough to provide the necessary clearance anyway. Remember to cut only on ONE SIDE of each keyway slot and make sure it is the SAME relative side of each.

Workshop Tips

Changing chuck jaws can sometimes be tedious when you can't tell which jaw is which. This is one easy way to quickly identify those jaw numbers without having to decipher the numbers printed on them.

Peter Johnson



Dave Adams

The Steam Locomotive in Australia and New Zealand

Part 2 - Locomotive Frames

By Allan Baker

The frame is the basis on which the locomotive is constructed, and many of the engine components are either held by or attached directly to it. This includes the driving wheels which are held within their axleboxes, the leading and trailing trucks that are pivoted to the frame, the cylinders are securely bolted to the frame, the smokebox sits in its saddle that is fixed between the frames, the front of the boiler is fixed to the smokebox and carried by the frame at the firebox end, the running boards in some cases are attached (as are side tanks if fitted) and the cab is secured to the frame in many types of locos. It can be seen from the foregoing that the frames play a crucial role, and therefore must be very strong in their construction to be able to withstand the weight and forces placed upon them.

Plate frames

Engine frames can be divided into three categories; plate frames, bar frames and cast frames. Examples of each type saw service in Australia and the first two in New Zealand.

Australia and New Zealand, being colonies of the British Empire, followed English designs of the time and the earliest engines in both countries had plate frames. As the name suggests, frames were cut from flat steel plate, varying in thickness from .625" in the earliest designs, up to 1.125" for more modern designs. The height of the pair of plates could be about 4 feet in depth and were held together by cast cross beams, called frame stretchers, that were usually riveted into the structure. Most designs had the frames inside the driving wheels, but there were some narrow gauge engines with outside frames, notably in the cane fields of Queensland.

Cut outs in the frame were provided for driving wheel axles to pass through and were strengthened by cast horns riveted to the insides of the frame. These horns gave a large area for the wearing surfaces of the axleboxes to work on. To minimise wear on the horns, hardened shoes were fitted to the horn faces for the axleboxes to bear against. In more upmarket designs the rear side of each horn was inclined to give a larger opening at the bottom. To this a hardened wedge with a matching taper was bolted, bringing the face of the wedge parallel to the shoe. This wedge was adjustable and was used to take up wear that occurred during the working of the locomotive.

A keeper plate known as a hornstay was fitted underneath the horns to keep the frame rigid during service, and was usually fixed onto tapered lugs for added security. The cylinders are bolted directly to the frames with mounting flanges cast as part of the cylinders. The earliest engines had inside cylinders which helped to stiffen the frames in that area.

If a leading bogie was fitted, the underside of the frame would be contoured to allow the wheels to clear. A suitable pivot would be provided for this truck on a stretcher or even under the smokebox saddle casting, depending on the type of truck.

In the early days, the rear of the loco frame was just behind the last pair of drivers. In this case the firebox would be a narrow one and located between and supported by the frames.

When wide fireboxes became necessary for increased power output, trailing trucks became a necessity to carry the increase in weight. This in turn required the frames to be extended rearward to accommodate the firebox and trailing truck. In plate frame construction, this was achieved by the use of an adaptor casting that was attached to the rear of the main frame and allowed the extension frame to be attached at the appropriate width. In this case the boiler would be supported on some kind of carrying plates under the rear of the firebox. The ashpan would pass through the frame extension, its shape and size being dictated by the trailing truck. There were also additional holes provided in the sides of plate frames at appropriate locations to give access to things such as the lower firebox washout plugs and oiling points for inside valve gears and brake shafts.

Plate frames have considerable weaknesses inherent in their design. For this reason they must be rigidly braced to withstand the forces created by movement of the locomotive and the pistons doing their work. Also, they were prone to serious cracking at the top corners of the horn cut outs. A good example, (or should we say a bad example), of this was the NZR K class 4-8-4's that were built from 1932. Additional strength in the plate frames for the subsequent Ka class was sought to overcome this shortcoming.

It would be fairly safe to say that the majority of Australian and New Zealand locomotives were built with plate frames, with every railway system using them, some almost exclusively.

Bar frames

As the Chief Mechanical Engineers of the Railways were always seeking improvements to their locomotive fleets, it comes as no surprise that they had the audacity to look to America and not England for ideas. Eventually they were permitted to import American products, often with much outcry in Parliament. These imported locomotives came mainly from the Baldwin Locomotive Works of Philadelphia. With these imports, bar frames were introduced to this part of the world.

Bar frames consist of steel castings about 4" in thickness, although this varies depending on the size of the engine. They are not as deep as plate frames but have all the same requirements for components to be fitted, and are joined together with frame stretchers. It was also quite common for components such as the running boards and cab to be fitted to the boiler rather than the frame.

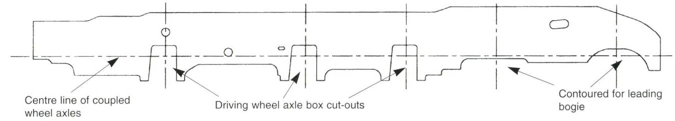

Centre line of coupled wheel axles
Driving wheel axle box cut-outs
Contoured for leading bogie

PLATE FRAME for a NSWGR C36 class 4-6-0

The depth of the frame reduces where the cylinders are attached, and they usually have shoes and/or wedges fitted to the horns. Frame extensions for locos with trailing trucks were castings that were bolted into place, and some had provision for trailing truck centring rockers to bear against at the rear of the frame. Most systems moved to bar frames for their biggest locomotives because of the greater strength and reliability that they gave.

The next improvement adopted by two systems in Australia was the cast locomotive bed. This steel casting incorporated the whole frame including the rear extension, brackets for such items as expansion links and slide bars and the brake hangers, but not the cylinders, in one rigid piece, eliminating the stretchers with their fitted bolts that could work loose. The first class to have this type of frame was the NSWGR 57 class 4-8-2's in 1929, and was followed by the SAR 720 class 2-8-4's in 1930 and the NSWGR 58 class 4-8-2's in 1950.

The last type of frame to be adopted was the ultimate way to give a rigid low maintenance frame. This one piece steel casting had all the features as the previous cast frame, but it also included integral cylinders, and the only classes of engines that were so fitted were the NSWGR 38 class 4-6-2's of 1943, and the 60 class Garratts of 1952. The 38's also had the main air reservoirs cast integrally, and these are clearly visible in photographs of the frames of these locos. Cast steel bar frames and locomotive beds usually came from the United States as foundries in this country were not in a position to supply such specialised castings.

We will continue our look at loco construction next time when wheel sets will be studied.

HOW A STEAM LOCOMOTIVE WORKS

A steam locomotive is a very simple machine by today's hi-tech standards. Its operation however was dependant on the co-operation of a competent driver and fireman who had to work together as a team to get the best out of the machine. This was because the fireman had to create the power needed to move the train, and the firing rate of the boiler had to be controlled carefully to match the power requirements that constantly varied throughout the course of any run, due to changes in such things as speed, grade and curvature that increased and decreased the rolling resistance of the train, and hence the power needed to move it at a constant speed. In turn, the driver had to run the locomotive in a manner that was not detrimental to the fireman's efforts, as he could thrash the engine and tear the fire to pieces and poor steaming would result, causing undesirable delays.

The heart that gives life to any steam locomotive is its boiler. This is filled with water to its correct level as indicated by the gauges in the cab and which covers the firebox crown and tubes that pass through the boiler barrel to the smokebox. Hot gases from the fire pass through the firebox plates and tubes by conduction to heat the water and turn it into steam, (at a pressure in the vicinity of 200 psi, depending on the individual design of engine) and make their way to the atmosphere via the tubes, spark arrestor and funnel. Air that enables the fire to burn enters the boiler mainly under the grate, although secondary air enters through holes in the firebox door. Excess pressure due to heavy firing is prevented by safety valves that have the capacity to reduce the boiler pressure even when steaming hard.

Fuel and water is carried in the tender, and these are fed into the boiler as required whilst running to maintain both the water level in the boiler and steam pressure. Coal is fired in most cases by hand, but larger locomotives sometimes have a mechanical stoker that carries the coal from the tender by the use of a rotating screw arrangement. Oil firing was also fairly common and most systems had oil fired locos at one time or another.

As steam and hence water is being used from the boiler, it must be replaced to maintain a constant level in the boiler. This is accomplished by the use of injectors, which have been previously covered in AME, or in a few cases a feedwater heater was used to increase efficiency and incorporated a reciprocating pump to supply water to the boiler.

Prior to moving the engine, the brake system must be charged up, and these can be either air or vacuum operated, being created by a steam driven air compressor or vacuum ejector. If a hydrostatic lubricator is used, it must also be turned on ten minutes prior to moving. A steam driven turbo-generator supplies 32 volts for the headlight and other cab lights.

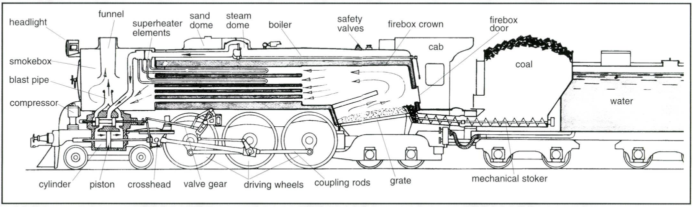
When standing still an artificial draft on the fire must be maintained to increase boiler pressure and prevent smoke filling the cab. This is achieved by the use of the blower, which is a pipe bent into a circular shape and located on the blast pipe with a series of holes pointing up into the funnel. Steam to this pipe is controlled by a valve in the cab, and the more it is opened the more draft is placed on the fire. The blower is usually turned right down or off whenever the locomotive is working as the draft is provided by the exhaust steam.

To make the loco move the driver has to set the valve gear in the desired direction, release the brakes and open the regulator. This controls a large valve located in the steam dome or the in the superheater header, and allows steam to pass from the dome, through the internal steam pipe to the wet side of the superheater header. The steam now passes through the superheater elements in the flues back towards the fire, and then returns to the header. By doing this, the steam increases in temperature and dries out the moisture particles carried out of the boiler with the steam. This gives it the ability to do more work in the cylinders and thus increase the efficiency of the engine.

On leaving the dry side of the header, the steam passes through the steam pipes in the smokebox to the steam chests of the cylinders, where it is distributed alternatively to each end of the piston by the valves, these being controlled by the valve gear. Once it has done its work in the cylinder by pushing the piston to the other end of the bore, the valve gear admits steam to the other side of the piston to push it back again. At this time the expanded steam on the other side of the piston is being exhausted through the exhaust passages and blast pipe to atmosphere through the funnel, and creating a draught on the fire to keep it burning fiercely.

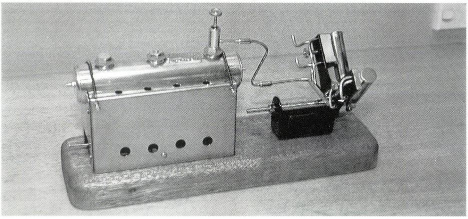
The piston rod is connected to the crosshead that moves backward and forward in its guiding slide bars, located behind the cylinders. The connecting rod is joined to the crosshead by the gudgeon pin, and converts the reciprocating motion of the piston into rotating motion at the main driving wheel crankpin. This rotating action is transferred to the other driving wheels by the coupling rods. Traction thus created is limited by adhesion, or weight on the driving wheels.

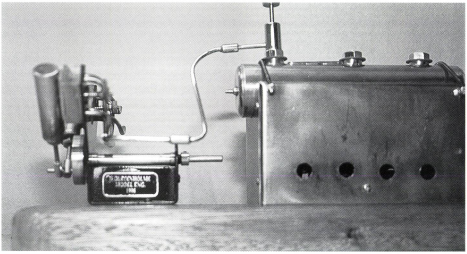
To stop the engine or train the brakes are applied, which causes cast iron brake shoes to come into contact with the tread of the wheels, creating friction that brings the train to a stop.



A Project from the Schools

Story and photos by Bruce Allen





In the NSW high schools the subject of Design and Technology was introduced as a Higher School Certificate course earlier this decade. As part of their assessment for the HSC, students are required to design a system, a product or an environment. A look around any school will show a range of projects from dog kennels, avante garde furniture, computer programs, modern and period fashion items, proposals for golf courses, resort complexes, solar powered homes, etc. The list is only limited by the imagination of the students.

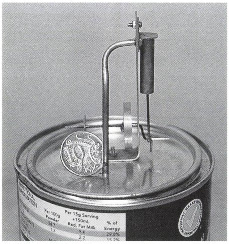
The students are to keep records of their design process and record their research and project development work in a folio that is presented for marking near the end of Term 3. As a teacher who has been able to see the work from various schools all that I can say is that the quality of the work has been impressive.

One of my students, David Wolstenholme, last year produced a twin cylinder double acting oscillating steam engine. The bore was 10mm with a stroke of 16mm. As part of his research he made a small one at home on the weekend. This can be seen in the photograph compared with a 10 cent coin. The interesting and innovative features are the combined cylinder cap and pivot made of a piece of brass sheet bent to an angle and soldered to the cylinder. The connecting rod is a piece of wire with the "big end bearing" simply a twisted loop. The boiler is a press top food tin and the lot performed quite happily on the kitchen stove.

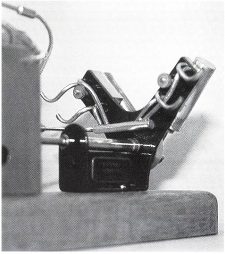
The frame was fabricated from steel and brazed together. The working parts were machined from brass and steel as appropriate. The boiler was designed and built to the provisions of the AMBSC boiler code even though it is under the scope of the code in all respects. The regulator valve and a rudimentary safety were both made by David and worked satisfactorily. The boiler is spirit fired.

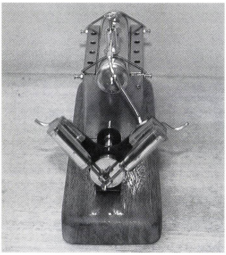
The model was painted a deep blue and to cap it off, a photo etched builder's plate, also made by David, was fitted to the side. The whole lot is mounted on a beautifully polished piece of timber.

As HSC markers roam the state during the fortnight of marking, they are encouraged to look out for outstanding pieces of work and recommend them for inclusion on a list for possible display at the Powerhouse Museum's annual DesignTech display. David's engine was one of three projects from my school for consideration. The other two were a design for an energy efficient house and a radio controlled hydroplane. We older modellers need not despair. There are younger modellers coming through to more than ably take our places.



The small practice engine. All other photos on this page are of the final engine.



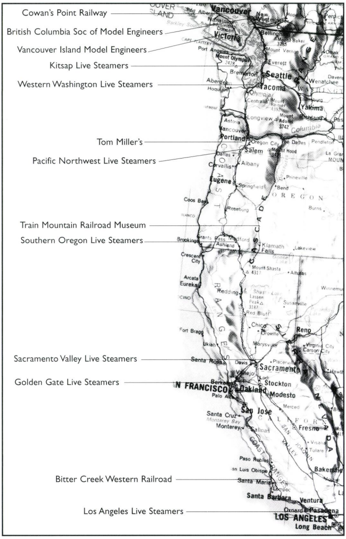


IBLS and the Traditional Roundup

Canada and the USA — August 2000

Story and photos by Murray Lane

During August and September of 2000 the five-yearly meeting of the International Brotherhood of Live Steamers, and the now traditional Roundup through other clubs on the way home, for those attending, was held on the northwest coast of Canada and the USA. The Roundup was coordinated by the British Columbia Society of Model Engineers who were the official hosts for the IBLS meeting. The map shows the location of the tracks that the 18 New Zealanders visited during their 4 week trip. Several other tracks were also included.


Cowan's Point Railway
British Columbia Soc of Model Engineers
Vancouver Island Model Engineers
Kitsap Live Steamers
Western Washington Live Steamers
Tom Miller's
Pacific Northwest Live Steamers
Train Mountain Railroad Museum
Southern Oregon Live Steamers
Sacramento Valley Live Steamers
Golden Gate Live Steamers
Bitter Creek Western Railroad
Los Angeles Live Steamers
Vancouver
Victoria
Seattle
Tacoma
Portland
Salem
Eugene
OREGON
Reno
Sacramento
Stockton
Modesto
San Jose
Fresno
LOS ANGELES

North and West America — Location Map

Friday August 11

British Columbia Society of Model Engineers

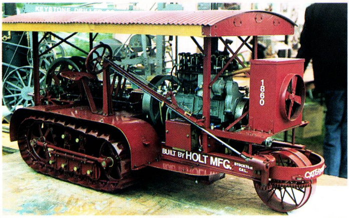
In early 1991 this society started the process of moving from the old site at the Burnaby Village Museum to the new 6.7acre site at Confederation Park, with the grant of monies from various sources. Work started on this site, which had been somewhat of a graveyard for dumped material, later in the year, while the club continued to run passenger trains at the Burnaby Village Museum tracks. The initial design was for a 5000 feet layout, with plans to extend it to 11,000 feet. This new complex was officially opened in early July 1993. At that time the BCSME had requested that they host the 2000 IBLS meet, and as a result many visitors at the opening decided that they would attend this five yearly meeting.

During the ensuing seven years the BCSME have consolidated their facilities and the new track extensions were completed shortly before the meeting with the placement of the final bridge. They have continued to provide a running schedule during the summer months, from which a large part of their finances are derived. Through their fine newsletter the *Whistle*, other clubs around the world have been able to keep up to date with the progress. With careful planning and help from the members, the BCSME have achieved all of their aims and the result was well appreciated by visitors who attended this meeting. The track layout gives an idea of the site, and there are several places with good gradients.

The Burnaby Central Railway Rainbow Creek Station is the largest seen on a miniature railway layout, and is designed as a traditional Canadian station. A full time caretaker resides upstairs.

An early arrival at the Burnaby Central Railway site at Confederation Park by the New Zealanders, was greeted by a flock of volunteers all ready for the meet, although there were not many other visitors around. This was due to the convention not starting until the following day. Dave Giles' Shay had been

This very nice model of the Shell Welder *is owned by Martin Rogers. It is a very large model and is nicely detailed.*



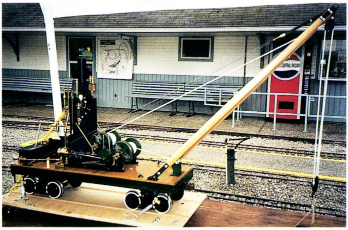
An excellent model of a very well made 1917 Holt tractor. This has a working 4 cylinder engine and a complicated system of gears and clutches to drive the wheels.

shipped to Vancouver in early June, and Lindsay McDonnell, an expatriate New Zealander, who picked it up the from the shipping company in Vancouver, arrived shortly after with locomotive. This engine was recently briefly described in the Jan-Feb 2000 issue of *AME*, and the design process of the burner unit in the July-Aug 2000 issue. This was quickly unpacked, the gas bottles charged and the loco oiled, before lighting up. Steam was quickly raised and the engine with the two ride cars was soon on the track with the troop of New Zealanders on board. The track switching was set to give a good long run, without running on the same section more than once.

There have been many improvements made since we were here last in 1993 for the opening of this track, several bridges and trestles having been added. On the original track there was a very steep section on a bend while going up hill. The grade over this section has been eased. There was also a dangerous cross-over on one of the steep grades, which has now been removed.

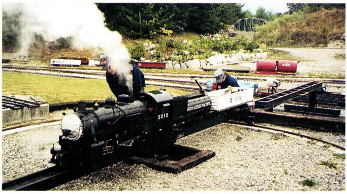
Saturday August 12

An 8 am start at the club for the guys, as most of them wanted breakfast. On a table in front of the station, was a nicely made log skidder by Norman Shepherd, which was made to a Bill Harris design. Refer to Live Steam 1989 issues January to October. Norman has fitted the skidder with bogies, and he belongs to the West Coast Railway Association at Squamish.



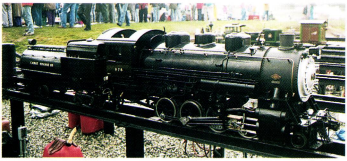
Norman Shepherd's log skidder

Stephen Vadeboncoer's Canadian Pacific Railway P2A heavy Mikado 2-8-2 PQ, is the only engine known, that can be fired on either oil, propane or coal. It only takes twenty minutes work to change from one form of firing to another. It was built over a period of 5 years, and is Steve's third engine. The engine weights 1400 lbs and runs at a pressure of 125 psi. This locomotive appeared in the last issue of *AME*. Steve's *Skytrain* was also on the track. This engine is around 4 foot long and the driver and passenger sit on top of the units.



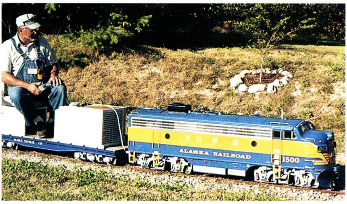
SP 3212 is seen here on the turn table between the steaming bays and the entry on to the track.

A fine Southern Pacific number 3212, a 2-8-2 built by Bill McCready 4 years ago, for John Turner, was being driven around the track by young Max Turner, the owners son. Most of the fittings on the engine are from Scale Railroad Supplies. Another young engineer, Robert Stephney, carries out the engine maintenance.

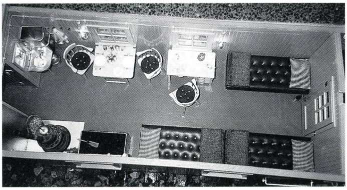


Here is a 1993 shot of Bill's own engine, a powerful Camas Prairie Railroad 2-8-0 switcher, beautifully made. This engine has a very even beat and sounds great coming up a hill with a load at slow speed.

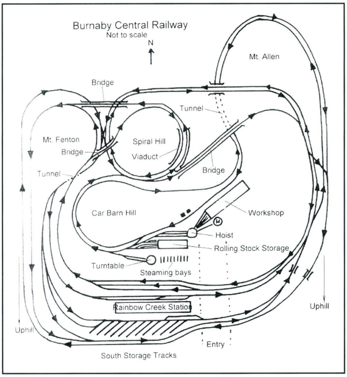
Patrick Durand from Alaska has built a fine looking EMD number 1500, which used to run on the Alaska Railroad, and is now located in a museum in Alaska. The colour scheme of blue and yellow makes the engine stand out, and Patrick has used the original engine for the details, and has produced several small cast fittings to make a great model replica. It has a very realistic sound generator for the engine, and when it is idling, it can be heard going up and down in volume as the compressor comes on and off load. The turbo can also be heard changing at the same time. In the cab the conversation between the engine driver and the control system can be heard. This is an actual recording and is played back via a tape recorder in the driver's car. Unfortunately this is all drowned out by the petrol traction engine when it is running on the track. From a by stander's point of view, this tended to spoil the other affects.



Patrick's EMD seen going up the hill to the station area.



The interior of a highly detailed caboose.



Tuesday August 15

Cowan's Point Railway

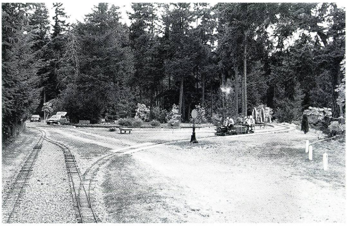
This is a private track and entry is by invitation only. A number of the group visited Cowans Island to run the Shay on Martin Rogers's track. 1993 photo shows the station area with Gavin McCabe sitting behind his Hunslet as it was. The original track is kidney shaped and runs through the woods, over a long wooden trestle, and through a tunnel. It is as near to a logging railroad as one could get. The track has been considerably extended since 1993 with a new 1000' loop. Unfortunately the Shay could not make it all the way round, due to the lack of clearance on the sides of the new 10' high Warren truss bridge.

Wednesday August 16

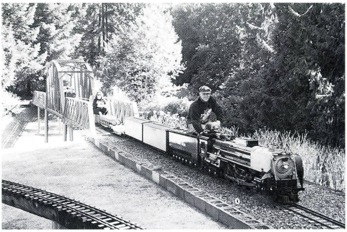
Vancouver Island Model Engineers

The Vancouver Island Model Engineers track is located at the Saanich Historical Artifacts Society site, north of Victoria. The rather flat $7\frac{1}{2}$" track is 2000' long and was officially opened in June 1982. There have been considerable improvements made since our last visit in 1993, including a small shop which sells food and club badges etc.

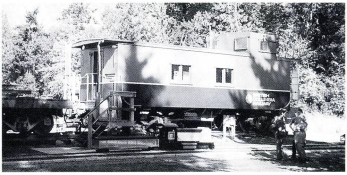
As in the previous visit we found that the local members were very friendly and helpful, and on a fine day this is great club to visit. The unloading facilities are one of the best seen, and the members had been working long hours to finish it off for the start of the now traditional tour of clubs, after the five yearly IBLS meeting.



This 1993 view of the loop around the 900' long raised $3\frac{1}{2}$" and 5" tracks, with Bill Southworth's old and battered Hunslet, which was driven by the Kiwi visitors, approaching the camera. The two parallel tracks seen in the above photo then continue past the new unloading facilities and steaming bays and eventually complete another loop in a paddock on the left hand side behind the photographer.



An impressive engine, Union Pacific FEF3 4-8-4 engine just coming off the bridge, with a rake of rolling stock, driven by Chuck Hackett from Nebraska. Chuck has owned the engine for five years, and is the fourth owner of this engine, which was built by Dennis Riches in 1969. It was recently overhauled and looks very smart for an old engine. This engine was seen at most the tracks that we visited.



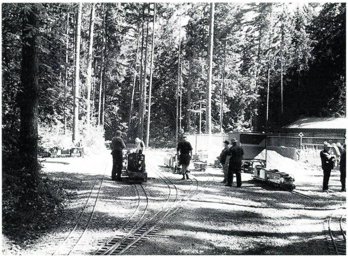
This old caboose serves as the club's clubroom, and the interior is full of memorabilia.

There is more information and photographs in the Live Steam magazine issues July 1982 and April 1983.

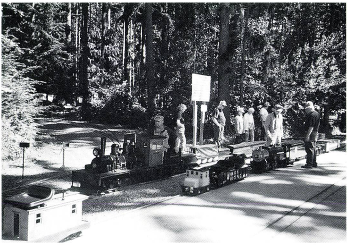
Thursday August 17

Kitsap Live Steamers

The Kitsap Live Steamers track is located in the South Kitsap Community Park in Port Orchard on the Olympic Peninsula. The track runs through fir and cedar trees, with the majority of it being hidden from view. The outer loop is just under 5000 feet long, and it is a very pleasant track to drive on. There is a bypass



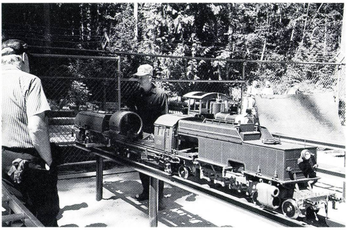
The steaming bays are just to the right in this view of the main marshalling yard.



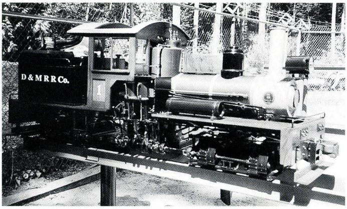
The station area is on the other side of the main loop. Roger Reynolds is driving Dave Giles' Shay on the outer track

loop which cuts off one end of the main loop to make a shorter trip. This is a relatively new track compared with many of the others in this part of America. It was formed in 1990 and the members have done a great job in setting it up.

A rather novel lifting frame on four castered wheels is used to transport the locomotives from the unloading bay around to the transporter which runs up and down the steaming bays. The lift is operated by four screw jacks in each corner of the frame, and these are connected together by chains and sprockets at the bottom. The power source is a large reversible electric drill which is held over one screw and drives a socket, turning the hex end of the screw.



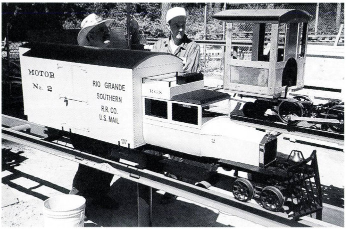
A large partly made Australian class 60 Garratt, which was made in Australia by Lyle James, was very prominently displayed on the steaming bays. This is now owned by Trevor Heath, and with the help of Geoff Robertson, he hopes to finish off this well made engine.



The 2" scale 13-ton class A Shay built by Dennis Weaver

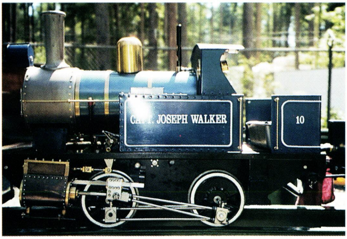
Also on the steaming bay were two other notable engines made by one of the founder members, Dennis Weaver. His first attempt to build a locomotive was a 2" scale model of an early two-cylinder 13 ton class A Shay with a T boiler. This has been basically designed around Bill Harris's *Mich-Cal* Shay, published in the Live Steam magazine some years ago. The 6" diameter horizontal tube of the steel boiler is .265" thick and the 8 " vertical section is .325" thick. The working pressure is 120 psi and it is fitted with copper fire tubes. The gear ratio is 2 to 1. The state authorities control the design and manufacture and testing of boilers in Washington state.

The other engine was made for his wife Marie, and is unique. It is scale version of the Rio Grande number 2 '*Galloping Goose*', as they were nick named, the official identification being Motor 1, etc. Seven of these petrol engine rail trucks were made for the Rio Grande Railroad. The magical part of this electrically driven locomotive is the sound system, which was recorded from one of the full sized units. The sound of the starter is first heard, followed by the engine starting. The graunch of the 1st gear being selected is heard just before the engine speed increases. It then changes gears twice more as the speed increases. A genuine klaxon horn is used. As it so happens, one of the original refurbished 'Galloping Gooses', was being recommissioned at Durango on the same day.



The Rio Grande Southern 'Galloping Goose'

The novel coupling and side rods on a little 0-4-0 tank engine called *Capt. Joseph Walker* were very noticeable. Instead of the rods being in one piece they are formed from two thin round rods, screwed into the end bearings. This is basically a $7^{1}/_{2}$" version of LBSC's *Tich* fitted with inside Stephenson valve gear. This was designed from Martin Evans valve gear book. Lee Horgan from Ridgecreast in the Mojave Desert made this novel little engine



Note the unusual rods as described in the text

over a period of 20 years. He was using a very tarry coal, and was having difficulty in keeping steam up, until Mike Orange advised him to try Aussie char, and soon steam raising was no longer a problem.

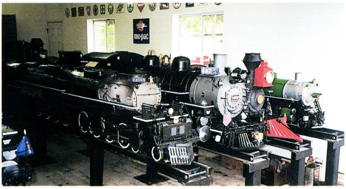
Friday August 18

Western Washington Live Steamers

Dave Skagens's private track (entry by invitation only), 6 miles north of Shelton, is the home of the Western Washington Live Steamers a few miles back up the road. Due to heavy rain not much could be seen, apart from the fact it was in a very nice setting, with the tracks running through bush. A pity really as this was the only wet day on the 4 week trip.

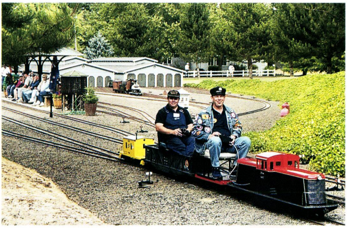
Saturday August 19

Tom Millers



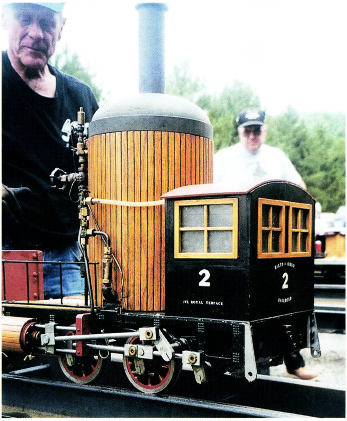
A view of Tom Miller's engine storage bay, which is in an extension to the workshop, showing the front ends of the Union Pacific Big Boy X4005, Durango & Rio Grande Rail & Western 2-6-2 K36 number 487, a Durango & Rio Grande Rail Road mogul number 10 and Tom Nicholson's Southern 4501

A general view of the steaming bays, with the end of the workshop on the right

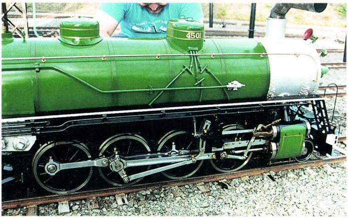


Greg Burrows and Ian McKay, behind Pat McCarthy's Ford yard switcher leaving the station. Note the scale wagon storage sheds in the background. Those on the left are for 1.6" scale with 9 cars on each track, and those on the right are for 2" scale with five cars on each track.

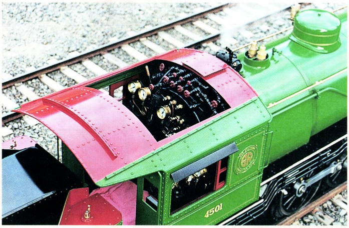
Heisler made by Walter McGowan, from the Kitsap Live Steamers, with John Turner's Mikado in the background.



A Baltimore and Ohio Railroad 'Crab' made by Dell Brown from Los Angeles. This engine has a steel boiler.



This Southern 2-8-2 engine number 4501, built by Tom Nicholson, has to be one of the most accurate and well built locomotives that I have seen. Note the details in these photographs (above and below).

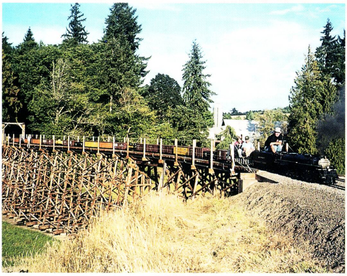


This is a private track and entry is by invitation only. A magic day was spent at Tom Miller's private track near Sherwood, south of Portland. With about 30 visiting engines present, this was the biggest meet to date, to be held at Tom's track.

The workshop would make any model engineer green with envy, and includes a mill converted to CNC control and a 6" Hardinge lathe, which is the best that money can buy in its class. Dave Giles used this lathe to make a drain cock piston, and said the there was absolutely no backlash in any of the controls. The continuously variable speed is altered by push buttons.

There is more information on Tom's steel track and photos in the 1992 May issue of *Live Steam.*

The highlight of the day was the steaming of Tom's Union Pacific 'Big Boy' X4005, and the new Rio Grande K36 487, seen here in the station area, with Tom on the Big Boy, and Bart Pond on the K36. K36 482, and 487 were built on site over a period of seven years. Further photos on the Big Boy can be found in Master Railroad Builder *by Steve Booth Pages 172 - 174.*



Tom driving the 'Big Boy' off the twin track viaduct built several years ago. This is fitted with a sprinkler system and there are fire hoses every 30 meters.

K487 heading back up the bank towards the viaduct, with a rake of 2" scale wagons, and Bart Pond at the controls.

A cupboard in the workshop contained several beautiful gauge 1 Durango & Rio Grande Western models, including three of the Galloping Gooses, no two of which were the same.

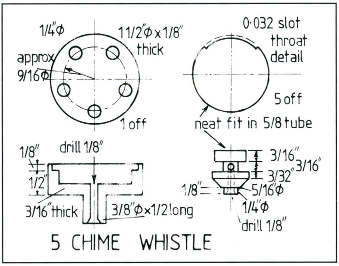
Murray Lane's account of his North American tour will continue in the next issue.

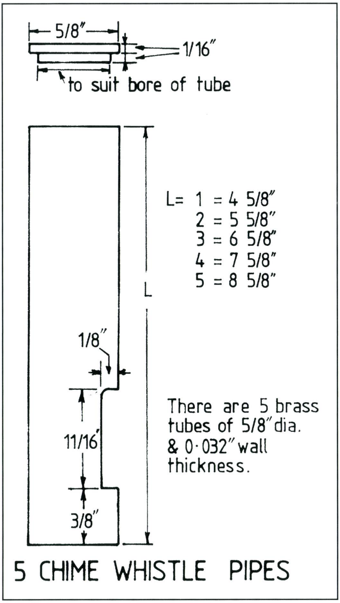
A Steam Chime Whistle

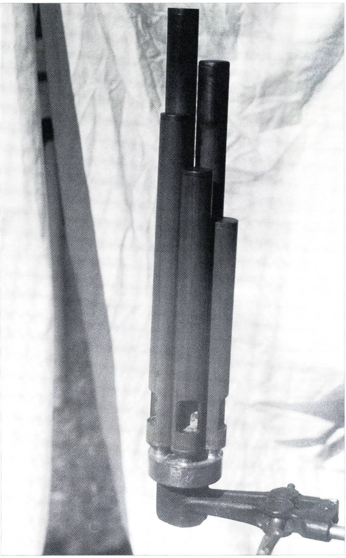
By John Cummings

Drawing for publication by Dave Adams

Sometime ago I was given a magazine called *Southern Miniature Steam* Vol. 2 No. 2, Dec 1985 (no longer in publication). In it was a sketch of a chime whistle from E J Murrell who says he got the design from David Archibald of the Sydney Society of Model Engineers. Mr Murrell says he improved on the original design, which I must say sounds fantastic, but for my purpose it was not compact enough, so I rebuilt it and here it is. Go and build one and drive your neighbours mad with it!







Handy Hints

- Feeler gauges can be a good source of small lathe tool packing, especially the cheap '$2' sets currently available. The cheap sets are typically softer and easier to trim to size.

  - Brian Smith

- Cleaning copper:— I use Selleys Rust Disolver® and it is magic. I used it on the tube ends in a fire box, a scrub with a wire brush helps, a wash with water and then I brazed the tube ends with success.

  - Ed Murrell

SLSV Kindred Society Run

Rolling Stock Rally, May 2000

By John Campbell

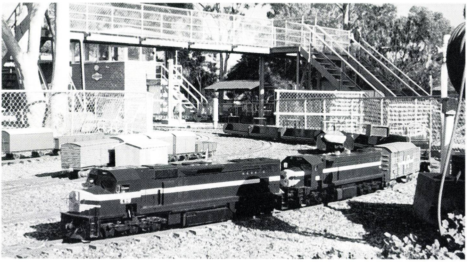
Photos by Ken Rofe

For this run the theme was scale rolling stock and there was a great display, almost entirely of Victorian Railways stock in 5" gauge.

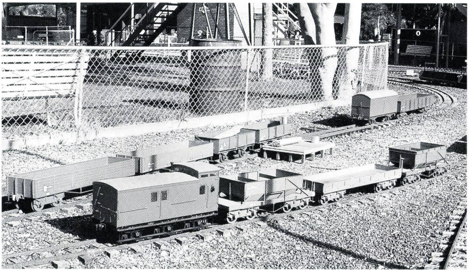
On Saturday (20th) the weather wasn't promising and a sharp shower at lunchtime didn't help. However, a BBQ lunch was enjoyed by those attending, after which the weather improved and we had a good afternoon with 104 names recorded in the attendance book.

Keith Hartley kept the records and told me that there were 27 trucks on 5" gauge, 3 on $3^1/_2$" gauge and 9 on the G1 (garden gauge) track. There were a few more on the G1 on Sunday. The VR rolling stock covered most of the older types of trucks and vans, making an impressive train.

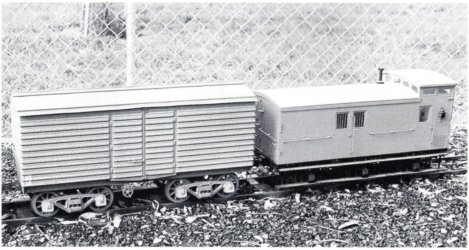
I counted 18 locos around the tracks including several electrics. Warrick Brisbane was seen driving his combined 'X' and 'C' class electrics pulling a long train, Neville Levin driving his 'S' class and in the bays was the amazing chassis for a VR 'G' class by John Johnstone.



Warwick Brisbane's VR C and X classes at the head of a 'mixed goods'



Some of the freight rolling stock in the yard at Moorabbin

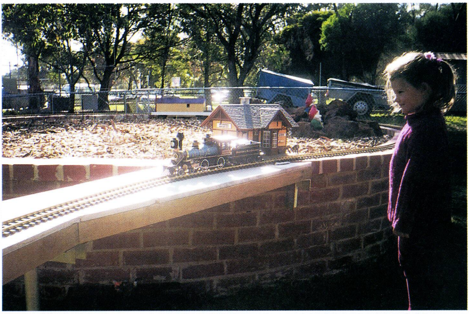


A Victorian Railways UB louvred van and Z guard's van

Bob Walker's 1957 Budd rail car

Action on the Gauge 1 track as Santa Fe F7 A and B units pass the signal box

A narrow gauge train passes the water tank on the Gauge 1 track



"Just my size'— an entranced youngster watches an American gauge one 4-4-0

The steamers, Peter Gray's 'X' class, Mel Skinner's 'K' class and Ron Dubber's 'E' class in chocolate colours of 1920 were among others showing their paces.

Graeme Campbell was down from Bendigo with his black 0-6-0 loco *Moyne*, driving car, gondola, a GY, T and two vans looking the part. Graeme received the trophy for the furthest traveled and Cliff Kirby from Eddington received the best exhibit award for his super scaled GWR brake van. Well done!

Bob Walker from Springvale had his 1957 Budd railcar which looks and sounds the part with some interesting detail inside its streamlined body. Son, Peter, also bought a T van complete with a guard who appeared from time to time to give 'right of way'.

The gauge one (G1) track was dressed up for the occasion with line side structures including stations, water mill, water tanks, signal tower and last but not least, a toilet! The weather was not the best for the G1 fans, but on both days they demonstrated locos and rolling stock that proved impressive.

Also seen running around were several of my electric tram design (as featured in *AME*) towing rolling stock and passengers. Mark Watkins displayed his 'large' boiler and cylinder block for his traction engine and David Smith ran his 2-8-0T chassis on air. Impressive stuff!

On Sunday the weather was fine with a lower attendance. However, with such a pleasant day, BBQ lunch, more running, lots of chat plus new members joining, the weekend proved a success. Thanks to the SLSV committee and members who ran the show and to AME for their publicity and support.

An assortment of 5" VR rolling stock

Sparks 'n' Arcs

Notes on Battery Care —12 Volt Lead/Acid

By Stan Allison

For batteries on charge/discharge duty cycle, it will be found that consistently discharging a battery *too* deeply will shorten its life unduly.

It is a matter of judgment whether to, discharge a battery to near exhaustion each duty cycle to get maximum running time or to get acceptable running time each cycle by "switching off" before exhaustion occurs. It is not possible to give credible figures for years or duty cycles that a battery will survive because of the variables affecting battery life.

However, some figures are offered as a *guidance*. A 100% charged battery at the beginning of each run and consistently discharged (a) to 70-75% charge gives quite long life but restricted running time each duty cycle, (b) to 50% gives optimum running time each duty cycle with acceptable life and (c) to 30% gives longest running time each duty cycle but with reduced life compared with (a) and (b). Constantly discharging to exhaustion, i.e. below 30% charge, will shorten the life of any battery.

Battery life is determined by the performance of the pilot — the weakest cell. Check the S.G. of all cells about every 9-10 duty cycles to find if the same cell is still the pilot or whether another cell has become the weakest.

The volts and S.G. column reading (table below) point to the percentage charge retained after charging or the charge left after discharging. *Allow 3-4 hours waiting time* before taking the volts or S.G. readings, for the readings become stable and comparable with readings taken at other times.

Battery Volts ± 0.1	Pilot Cell S.G. ± 0.01	State of Charge
12.8	1.25	100%
	1.22	75%
12.5		70%
12.3	1.19	50%
12.2		40%
12.1	1.13	30%
11.9		10%

Battery charging is dealt with on page 34 AME issue 85. The float charger referred to can be adapted for traction battery charging by replacing the resistor R1 on the 13.8 volt unit with an adjustable resistor of 1,000 ohms (Dick Smith Cat Nº R1900) and adjusting to 14.5 volts output.

Alternatively a fixed resistor can be used in series with one battery charger's lead to give a float voltage charge.

An electric jug element can be used by stretching the wire and coiling two element strands together and cutting off the resistance at about six (6) ohms. Coil the wire back onto the porcelain holder. Once the battery has been charged, introduce the float charge resistor and over a number of days gradually shorten the resistor until the battery floats between 14.1 and 14.7 volts (no more). (The float voltage may vary by the day due to day temperature variations etc., but floating between 14.1 and 14.7 volts will be satisfactory).

Probably the most useful test is the voltage reading taken 3-4 hours after the end of the float charge the day the battery is to be used. This reading will give the percentage charge the battery retains when compared with the battery as new.

If the full charge voltage starts to decrease over a number of duty cycles, check the S.G. of the pilot cell and from the S.G. check the percentage state of the pilot. Failure of the pilot cell means the whole battery has failed.

Finally, deep-cycle batteries can be expected to give at least twice the life of an "ordinary" battery if discharge is held at 70% and, to get better than 1.5 times if discharged to 50% but, if discharged to 30% or lower the advantages of deep cycle batteries can be minimal.

Expanded Range Voltmeters

By John Edwards

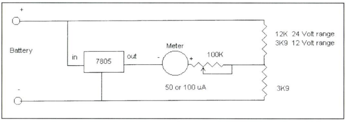
As all *Sparks 'n' Arcs* readers know when running on batteries it is very useful to know the condition of the 'petrol tank' when running. It doesn't take long to find out the average analog multimeter or voltmeter is not a very useful way of judging the state of the battery. The scale of interest while running is around 10 to 13 Volts for 12 Volt systems, and around 20 to 25 Volts for nominal 24 Volt systems.

Here is where the expanded scale, suppressed zero, meter becomes useful, expanding the 10 to 14 Volts or so (or 20 to 25 Volts) across the full scale of the meter.

Fortunately with modern electronics a suppressed zero meter can be made with only four components plus a meter.

Mounting the regulator and other components on a small board on the back of the meter keeps leads short, otherwise a small capacitor may be needed at the input and/or output terminal of the 7805 regulator.

Diagram



To calibrate the meter, apply the desired full scale Volts to the terminals and adjust the 100K trimpot for full scale. Alternatively the meter can be adjusted to read exactly the same as the reading on a known digital Voltmeter or multimeter. Input voltage of 10 Volts (for 12 Volt range) or 20 Volts (for 24 Volt range) should give a reading of zero on the meter. Yes, the meter reads backwards for input voltages below 10 Volts (20 Volts for 24 Volt range) but when battery voltage is this low the electric loco has probably ceased running anyway.

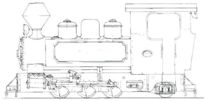
For purists who want exactly 10 Volts or 20 Volts at the zero point on the scale, a small trimpot (500 Ohms to 1K) can be used between the two 3K9 resistors and adjusted to zero on the meter.

While on the subject of meters, an ammeter using a low resistance shunt in the motor lead can use the same meter movement (along with a suitable series resistance). A momentary contact double pole change-over switch can read either motor current or battery voltage with the same meter at the push of a switch.

Suppliers and part numbers

Meter	Dick Smith Q2047 or Q2021 Jaycar QP5012
5 Volt regulator	Dick Smith Z6545 Jaycar ZV1505
Trimpot	Dick Smith R1095 Jaycar RT4620 or RT4656

Bunyip



A Bundaberg Fowler 0-6-2T in 7¼" gauge — part 15

by Ian Smith

Drawings and photos by the author unless credited otherwise

Mark out the front and back tube plates. Clamp the front tube plate to an angle plate and find the centre of the plate using a Vernier height gauge and move it up 95mm and scribe a line. Then come down to the centre and move another 6mm for the first row of holes then scribe a line and other 22.2mm and scribe another line. Keep repeating till you have six lines. Rotate the plate 90º, find the centre of the plate and scribe. This will give you the centre of the regulator and steam pipe outlet bushes and the centre to start marking out the first row of holes. They are 25.4mm apart then the next row are 12.7mm offset. Repeat till you have the required number of holes, i.e. 47. The two outer holes on the bottom row are tapped ½"BSP for inspection, repeat the marking out on the throat plate with 45 holes. Drill and bore the 40mm dia. hole for the steam pipe and regulator bushes.

The crown stays were profile cut from 20mm plate, the welding face was trued up in the mill, the weld preparation machined and the crown plate was machined. In the same way mark out for the siphon pipe inlet and the fusible plug holes. Drill them 19mm dia. and tap ½"BSP. The weld preparation were turned on the two plates (they are "J" preparation). They were clamped up on a face plate with a scrap piece of steel so as not to cut into the face plate. Next the throat plate was cut in two in the milling machine using a slitting saw; there has to be a 12mm wide strip machined out of it. Measure the crown plate for size and only cut out that amount; the first cut is 12mm above the centre line of the plate. It leaves about 8.5mm above the top edge of the row of 19mm holes so the weld preparation is a Vee and is welded full penetration from both sides.

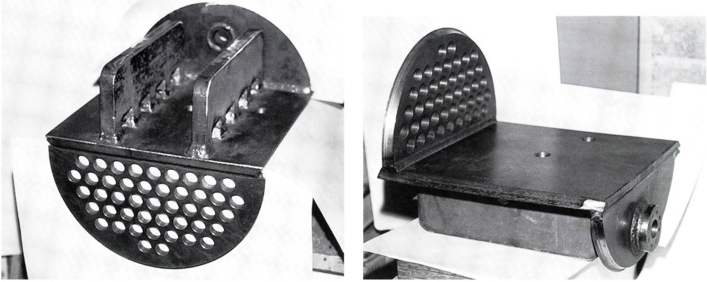
The regulator and steam bushes can be machined now. They have a 40mm diameter step x 16mm long for the front tube plate and x 12mm long for the back head. Turn 57mm dia. x 20mm long centre and drill 25mm dia., part off after the 20mm, drill 8 holes 4.2mm dia. on a 45mm PCD x 12mm deep, drill the 5mm dia. telltale hole (AMBSC Code Part 2), press in and weld.

The steam dome is made in two pieces of 141mm dia. x 9.5mm wall thickness x 100mm long for the top and 75mm long which is welded into the boiler barrel, after a flange of 12mm thick plate x 200mm dia. has been welded on and faced off and drilled for 16 holes 8mm diameter on a 173mm PCD. With a lug welded on the inside cut from 32mm wide x 65mm long x 10mm thick, shape one of the long edges to the inside of the tube, drill and tap two holes M6 at 45mm centres and 12mm in from the other side, 20mm down from the top of the flange fully seal weld. Now the tube can be welded in with the top of the bolting flange 60mm above the top of the boiler barrel. The top of the steam dome is 100mm high with another flange and a 12mm thick cap welded into the top; there are three tapped holes on a 65mm PCD tapped ½"BSP. Drill and tap them before assembly so they will be in the right position, two square across the boiler facing the front of the boiler to take the safety valves and the rear one for the steam whistle.

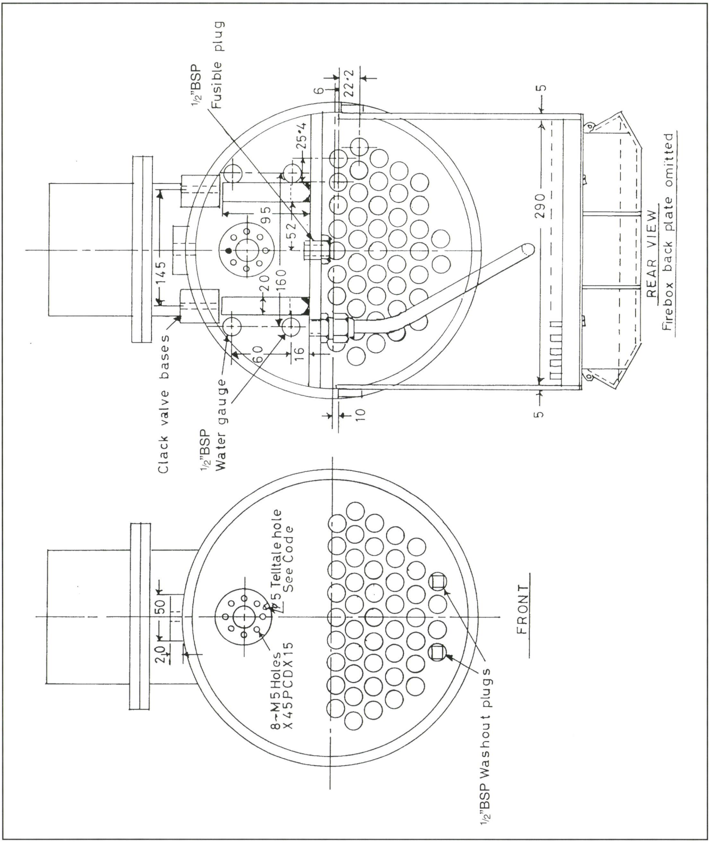
The water feed inlets are made from 38mm dia. x 45mm long. Check the length in the barrel — they sit up 8mm above the top of the barrel. To weld them in position make a jig out of 40mm wide x 6mm thick steel to bolt them to at 145mm centre distance and were it touches the barrel, put an 8mm packing between them. They have an 8mm diameter hole in the centre and 4 holes on a 25mm PCD. Drill and tap M5 x 12mm deep checking they are square to the barrel.

The bush for the manifold is turned to 44.5mm dia. x 20mm long, turn a step 30mm dia. 15mm long then turn another 50mm dia. x 20mm long. Centre and drill a 10mm diameter hole and part off 35mm long. Drill 6 holes 4.2mm dia. on 32mm PCD and tap M5 x 12mm deep. Drill the 5mm diameter telltale hole (see AMBSC Code Part 2) and press the bush into the barrel with the holes running down the centre line.

The four clamp-down block that clamp the sand domes to the boiler are made out

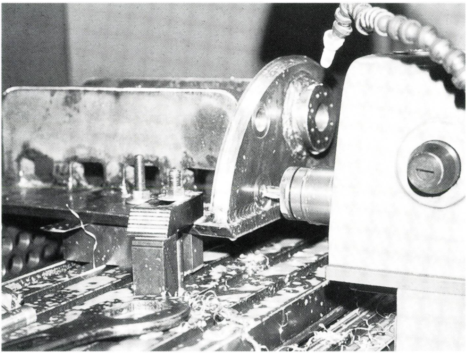


Two views of the throatplate, backhead, crown stays and crown after they have been welded into one complete assembly.



of 20mm square MS x 50mm long and are put under the press and bent a little to the shape of the barrel and have a M8 thread tappet in the centre and welded on all sides to the drawing.

The throat plate, crown, crown stays and back head can all be assembled and welded. The siphon pipe inlet is drilled and tapped 3/4"BSP 170mm from the throat plate and 50mm from the edge of the crown plate. Check that the hole will clear the crown stay before you drill the hole. The fusible plug hole is to be drilled and tapped 1/2"BSP in the centre of the crown. Set up the crown assembly on the milling machine to drill and tap for the water gauges. Set up on the table on parallel strips and using a dial indicator, set the back head parallel to the table travel and clamp solidly to the table. Come up 16mm from the top of the crown plate and 80mm out from the centre line, centre and drill 19mm for 1/2"BSP before moving. Use a 32mm shell mill and spot face the plate, take a dial reading and tap, move the milling head up 60mm and repeat the same process. Move to 80mm



Machining the backhead for the water gauge mountings

to the other side of centre and repeat, remove from the milling machine and tap $^1/_2$"BSP, if you could not tap them in the milling machine.

The water leg is next. It is made out of 32mm dia. x 85mm long with a 27mm dia. x 40mm long for the siphon pipe fitting, the two be turned and welded in at right angles. Turn down the 27mm dia. bar to 24mm dia. x 23mm long, reverse in the chuck and turn to 26.4mm and thread $^3/_4$" BSP x 17mm long. Drill a 14mm hole through it, turn a 90° countersink in the end x 23mm dia. to suit the siphon fitting. Put the 32mm dia. bar in the three-jaw chuck, center and drill 16mm dia. hole through the bar. Mark the pipe entry at 40mm from one end. Set that point up to run true in the four-jaw chuck, centre and drill 16mm dia. into the centre of the through hole. Open out to 24mm to the centre of the 16mm through-hole and then turn the weld preparation. Weld in the siphon pipe fitting, put the water leg in the lathe and feed the 16mm diameter drill slowly through the 16mm hole to clear out to, open out the first 20mm to 19mm diameter and tap $^1/_2$"BSP for the blowdown valve. Now the water leg can be welded into the barrel. As all the welding has been done on the boiler barrel, with sealing welds on the inside of the barrel put the barrel back up in the cradle on the milling machine. The flange on the steam dome will have to be machined as it would have warped during welding. Check that the crown is square to the table and machine the steam dome flange. Check with your boiler inspector before welding the boiler together. After the boiler has been welded, weld two lugs 25mm wide x 6mm thick x 30mm long with a 6mm diameter hole 12.5mm in from the end. In the centre of the bar they get welded on about 45° either side of centre and flush with the edge of the firebox cut out. The other two bolting strips are 25mm wide x 6mm thick x 285mm long. They get welded on the cut out edge of the boiler barrel, edge to edge square to the centre line of the boiler to hang the firebox from. Drill four 6mm holes along the centre line equally spaced.

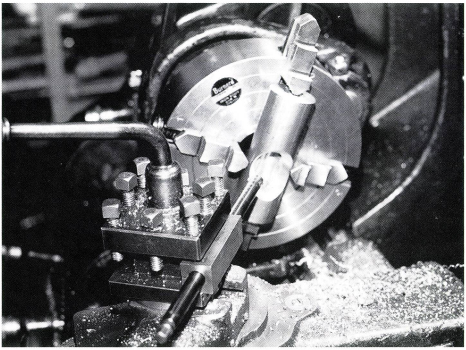
Now the copper tubes can be fitted 19mm dia. x 1.6mm thick hard drawn. To measure the length of the copper tubes, pass a tape through the tube hole and measure the over all length and add 16mm to the length (6mm sticks out on the fire box end) to allow for beading over the firebox end and bell mouth the smokebox end. You will need to anneal the ends for about 40mm long before fitting. Have 6mm sticking through the throat plate, expand then expand the smokebox end. The fire box end can now be beaded over (Doug Baxter in his articles on boilers explained the type of tool and how the tubes were beaded over) and the smokebox end bell mouthed.

Make the siphon pipe fittings to the boiler code and bend the 16mm diameter copper tube to shape and silver solder the siphon tube into the fittings and clamp in position. Make the $^1/_2$"BSP fusible plug to the boiler code and fit to the crown.

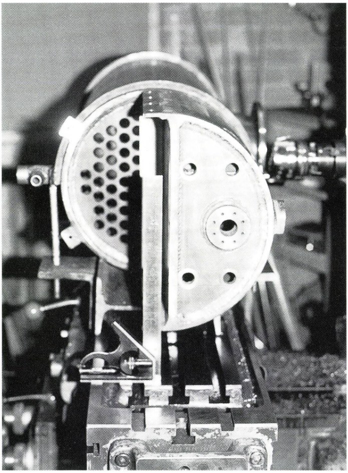
Firebox

The firebox is fabricated from 5mm plate. Cut two pieces 185mm wide x 267mm long for the sides, one piece for the back plate 290mm wide x about 250mm long which has to be cut to the radius of the inside of the boiler barrel. Clamp the two side plates to the boiler on the inside of the bolting strips on the boiler, drill and tap the four holes M6 and measure the length that the back plate will be with the radius cut out and tack the three pieces together. Drill and tap the two M6 holes in the back plate. Cut two 15mm wide x 267mm long strips x 5mm thick and tack them on the inside of the firebox on the two side plates, flush with the front edge so that the firebox front plate when bolted to them, can be removed for access to work in the firebox.

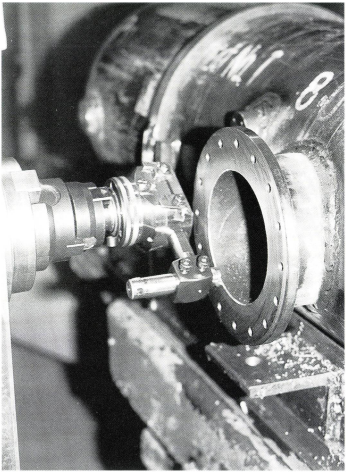
Before cutting the front firebox plate fit the boiler into the smoke box and set the boiler barrel parallel to the side frames with the dome flange square across the frames so the dome is not leaning to one side. Check that the bottom of the firebox is level with the top of the cut out in the frames and if not, scribe a mark on the sides of the firebox remove the boiler and



Turning the weld preparation on the water leg in the 4-jaw chuck



After all the welding is complete, the boiler is set back up in the cradle on the milling machine, ensuring that everything is square.



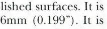
Now that everything is lined up and square, the steam dome flange is machined to remove any warping caused by the welding

trim to size. Measure and cut the firebox front plate to size. It has to go from the top of the crown plate to the bottom of the firebox and the full width of the firebox. Next measure the inside of the firebox and make the firebox foundation ring to hold the grate and the ash pan assembly. It is made out of 25mm wide x 12mm thick MS for the two sides and 40mm wide x 12mm thick MS for the front and back of the firebox.

The firebox is lined with fire bricks 25mm thick and that leaves a 15mm wide strip front and back for the grate to sit on. The front firebox bar has a cut-out on each end for the two bolting stips 12mm wide x 5mm thick so when the firebox front plate is bolted on to the firebox it will bolt hard against it with no air gap between the foundation ring and the front plate. Bolt the front plate to the firebox with four M6 studs down each side starting 20mm from the top and 12mm in from the side and 20mm from the bottom and the other two evenly spaced between them. There are two studs to go in the bottom of the plate that are tapped into the foundation ring, 65mm either side of centre of the plate and the same on the back plate of the firebox into the foundation ring.

Mark for the hole that has to be drilled to let the siphon tube and nut can pass through the firebox wall, remove the firebox and drill the hole to suit. While you have the firebox off the boiler and the front plate still bolted on, weld the sides of the firebox but not to the foundation ring. Fit M6 studs to hold the front plate on and put M6 bolts through the back plate into the foundation ring.

To be continued ...



Workshop Tips

During one of my recent discovery missions (scrounging trips), I came across a source of materials which may be useful in model engineering. It is a thin narrow springy stainless steel strip found in the edges of late model wiper blades, presumably to add some stiffening to the rubber. So far I have found two different types and sizes; there may be others. I don't know the grade of stainless used but they are probably 400 series as they are both mildly magnetic although neither appear to exhibit much if any permanency

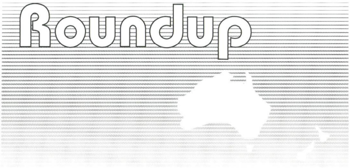
Type 1. This was found in both Toyota and Daihatsu blades. It has very smooth surfaces with a moderate polish, the longest piece so far discovered being 420mm (late model Corolla). It is 0.7mm (0.028") thick with a width of 2.45mm (0.096"). The edges are nicely radiused (almost semi-circular); they also have smooth almost polished surfaces. Its quite soft to drill (0.75mm drill) and doesn't appear to be too tough.

Type 2. This was found in a considerably older vehicle (N600 Honda van about 30+ years old) so may be more difficult to obtain now. It has fairly smooth but unpolished surfaces. It is 0.44mm (0.017") thick with a width of 5.06mm (0.199"). It is easier to bend than the type 1 but tougher to drill. It readily retains a light 'set' and is slightly less springy than type 1.

Jim Gray

Do *you* have any useful workshop tips or handy hints?
How about sharing them with the rest of us.

Club Roundup



compiled by Neil Graham

Auckland NZ

The loading ramp has been modified by Mike Orange to make loading and unloading of locomotives much easier. The fun run in April attracted four locomotives and several more members. Alan Gasteen has been trialing his new Dsa and it has performed very well. It has been offered as a backup loco for running days. Steve Day has steamed up his SR&RL No.24 locomotive for the first time at the ASME track, and Barbara van Ryn has gained her licence for electric locos.

The exterior of the clubhouse has been painted, and the new colour blends in well with the surrounds.

A *Not According to Plan* night is being organised for December 5, where everyone is invited to table their construction/workshop "cock ups", the object being to entertain and have a lighthearted Christmas meeting.

There has been a good turnout of public over the recent months.

Auckland Society of Model Engineers
Location: *Petersen Rd Reserve, Waipuna Rd, Panmure*
Public Running: *Every Sunday*

Balcatta WA

The club has welcomed three new members.

A special event was organised for the July meeting, three feature speakers gave a presentation on miniature jet engines. There were completed models through to components on display. The highlight was a demonstration run of an engine on the test bed.

Northern Districts Model Engineering Society
Location: *Vasto Place, Balcatta*
Public Running: *Last Sunday*

Ballarat Vic

At the AGM, Frank Adams was relected President and Ed Davies Treasurer. Peter Darveniza is the new Secretary (email: darveniz@mail.austasia.net) and the new Vice President is Terry Armstrong. The club has a new address: PO Box 351, Buninyong Vic 3357.

Ballarat Society of Model Engineers
Location: *Dorrington Road, Warrenheip*
Public Running: *None*

Berry NSW

Like Lazarus, the club is going to rise again. With the sale of the land at the old track site, a new site has been offered. Much preparatory work has already been done. Les Irwin has cast literally thousands of concrete sleepers for the new track and new scale section steel rail has been purchased, enough to complete the proposed railway.

Also the all-welded bridge has been completed (not unlike Brisbane's Storey Bridge) and the clubhouse/station of brick construction is in place and ready to have a roof installed.

Berry Railway Inc.
Contact: *PO Box 324, Berry NSW 2535*
Public Running: *None*

Berkeley USA

Three sections of track have been replaced by the Sunday work crews and repairs have been completed to the outside loop at milepost 14. The roof of the Clerici barn has been repaired.

Golden Gate Live Steamers Inc.
Location: *Tilden Park, Loma Cantadas & Grizzly Peak Blvd., Berkeley CA.*
Public Running: *???*

Brisbane Qld

Due to re-development plans by Brisbane City Council, the Brisbane Live Steamers have relocated to Bayside Heritage Train Park on Wynnum Road, West Wynnum. An approach by a Lions Club to be involved and assist with the move was declined though the burden of the move has subsequently fallen on a small group of members.

The outcome is a delightful new track with somewhere around 2300 feet of 7$^{1}/_{4}$" gauge track ready for running by the last Sunday of August and possibly about 1,000 feet of 5" ready soon after. We look forward to many hours of train running through the Heritage bushland.

Brisbane Live Steamers
Location: *Bayside Heritage Train Park, Wynnum Road, West Wynnum*
Public Running: *Last Sunday*

Burnaby BC

Doug May has assembled and painted 10 bulkhead type ride astride cars. These have been stored awaiting bogies. The Work & Pizza evenings still attract good turnouts, with 18 attending in the last week of June. The most noticeable change at the track has been the addition of the blacktop in the loading area and the access road.

British Columbia Soc. of Model Engineers
Location: *Rainbow Creek Station, 120 Nth Willingdon Ave, Burnaby BC Canada*
Public Running: *Saturday, Sunday & public holidays, Easter through thanksgiving*

Casino NSW

At the AGM, held in the Old Casino Railway Station Museum, the members were so pleased with last year's performance that all officers were re-elected unopposed for another twelve months.

During the year a team of enthusiastic members built a kiosk at the North Casino Station end of the railway and other projects are being attended to with gusto. All are welcome to visit our 5"/7$^{1}/_{4}$" ground level track which gives a thirty minute round trip through the beautiful wetlands to our rail museum at Old Casino.

Pacific Coast Railway Society Inc
Location: *cnr Queensland Rd and West St, Casino*
Public Running: *Every Sunday*

Christchurch NZ

The booking dept. has been busy accepting bookings well into 2001. The committee has agreed on the pond re-sealing method and the work is expected to be completed before the November exhibition. The footbridge has been sand blasted, primed and painted. Member Ian Fanshawe has been appointed technical liaison delegate to the AMBSC.

52 members attended the May AGM and Ross Fielden was elected president and Kelvin Lewis the Secretary.

Canterbury Society of Model & Exp. Engineers
Location: *26 Andrews Cres, Christchurch*
Public Running: *1st & 3rd Sundays*

Cobden Vic

At the recent elections, John Wiggins was elected President and Allan MacCaskill the Hon. Secretary. Grounds improvements continue apace with a second windmill installed, the station building receiving paint touch ups in parts, and the station interior has had a gas stove kindly supplied and fitted.

The level crossing lights and signals now complete and in operation.

South Western Model Engineers Inc.
Location: *Grayland St, Cobden*
Public Running: *3rd Sunday*

Eltham Vic

Much new track and point repair work has been completed, with plastic sleepering and including construction of a single slip (spare) put to storage. Many trees continue to be planted, mainly in the Jack Tatum picnic area. Level crossing posts are being re-painted.

Loco G517 has had much overdue maintenance completed and axle sets swapped to even out the wheel wear. The original air compressor has been replaced with an electric type, and basically the engine has been re-wired as well. The rebuilding of D1300 has been re-started with the bogies near completion, and a near new Kubota 3-cyl diesel engine and hydraulic transmission pump have been married.

On the passenger front, the railway carried 33,500 passengers till the end of June, up 2.85% on the previous year. The 2 millionth passenger is expected to be carried sometime in September.

Still with mile stones, the DVR now has a 24 hour information line, (03)9439 1828, to answer the growing number of public enquiries and recently received two grants of $6000 each from Parks Victoria and the Department of Infastructure to assist with grounds improvements.

Diamond Valley Railway Inc.
Location: *Eltham Lower Park, Main Road, Eltham*
Public Running: *Every Sunday & Public Holiday*

Galston NSW

The proposed new workshop has been board approved. It will be 8 x 5 metres Colorbond® with door at each end. Quotes are now being considered.

Whilst May and June run day figures were down, the July day had bumper crowds with near record figures.

The scale timetable run last August was a success with over 50 members and visiting drivers and a wide selection of locomotives and rolling stock, the majority of goods wagons being NSWR prototype, with a healthy smattering of English and VR types. All who ran with trains enjoyed themselves and eagerly await the next run of this increasing popular area of operation of the railway part of our hobby.

On the boating front, Peter Scaysbrook's tug with water cannon always creates a great deal of interest. John Knight's almost complete Thames sailing barge is awaited with interest. It is proposed to paint the lower deck of the wharf with non-skid paint when the opportunity presents itself.

Hornsby Model Engineers Co-op Ltd
Location: *29 Mid Dural Road, Galston*
Public Running: *2nd Sunday*

Gosford NSW

The 7¼" gauge track extension is proving very popular with the public. The June running day was on of the busiest ever, with excellent weather brining out the people in droves. Even at 4pm there were still people waiting in the queue.

The long awaited 5" track extension is nearly complete and is eagerly awaited, which should return the smile to the smaller gauge members. General cleaning up and beautification of the grounds continues under the driving force of John Crowhurst.

Central Coast Steam Model Co-op Ltd
Location: *Lot 10 Showground Rd, Narara*
Public Running: *1st Saturday*

Luddenham NSW

The railway section has had a lot of work completed recently with trees around the station tracks pruned and tidied up, sleepers replaced on the track leading to the station and re-ballasting. The hardwood decking on the bridge before Swallows Roost is being replaced with weldmesh. New hand rails have been made and fitted to the new platform.

Running days have been good with many members and the public riding the trains.

Radio frequencies have been allocated for the scale cars and the boat pond so they can both operate unhindered. The Garden Railway is to be re-located from inside the elevated railway to the slope behind the clubhouse.

At the 2000 NSW and Australian car titles, Peter Henley from SA won the sedans, Rob Jefferson won the 35cc sprints and Paul Daly the won the 29.5cc sprints.

The inaugural aircraft Team Race and Speed weekend was conducted last July, and the NSW Tethered Car Championships held at the end of April. The 10cc was won by Ron Bernhardt at 315.38kph. Karl Sepetauc won the Australian built section with a speed of 175.87kph. Congratulations to Tony Peacock with a new Australian record for 10cc of 318.50kph.

Sydney Society of Model Engineers
Location: *R53 Luddenham Road, St Marys*
Public Running: *Last Sunday*

Maidstone NZ

The new 7¼" gauge track is expected to be running for the new year, as work progresses at a satisfactory rate.

Maidstone Model Engineering Soc. Inc.
Location: *Maidstone Park, Upper Hutt*
Public Running: *???*

Mangere NZ

The Queens Birthday weekend was wet, but, it didn't stop the people from coming and enjoying themselves, with visitors from afar as Wellington. Bits and pieces nights remain an interesting forum to see how others are doing their model engineering construction.

Manukau Live Steamers Inc.
Location: *Mangere Centre Park, Robertson Road, Mangere*
Public Running: *Every Sunday*

Millswood SA

The SASMEE grounds and trains were recently utilised as the venue for an amateur film production which required some special train working by the members, after the completion of public running.

April saw another night run at the track, with five locos staying, including John Meres' 720 from Railway Park, a successful run with the last fires being dropped after midnight.

The programmed introduction of plastic sleepers onto the 7¼" gauge track has been completed for the present time. In May, a new section of 5" gauge track was brought into service between the tunnel and steel girder bridge.

Also, the public run day was declared a benefit day for the Steamranger 620 class loco to assist finance its return to service. Seven 5" and five 7¼" locos were on the roster for the day.

The club has recently increased its membership by two new members.

South Australian Society of Model & Exp. Engineers
Location: *off Millswood Cres, Millswood*
Public Running: *1st Sun. and 3rd Sat.*

Moorabbin Vic

July open day saw two booked groups arrive early, so running also started early and a long and busy day followed. Track work at Petticoat Junction has seen the ballast removed down to the track bed and track re-laid and re-ballasted.

The Christmas in July night was a tremendous success with 40 odd in attendance.

Silvertops regularly get between 25 and 30 attending along with between 4 and 7 locos in steam. Club members run days continue to attract over 40 members and several locos. Public days average 45 members and 10 locos for the roster.

Steam Locomotive Society of Victoria
Location: *128 Rowans Road, Moorabbin*
Public Running: *1st Sunday*

Nelson NZ

Winter rain has kept the Sundays fairly quiet, although the Queens Birthday Monday was a good run. The club exhibited at the August Crafts and Hobbies Exposition on the 12-13 August last.

Nelson Society of Modellers Inc.
Location: *Adjacent Tahuanui Beach, Walkare St, Tahuanui*
Public Running: *Every Sunday afternoon*

Newcastle NSW

The club has gained three new members and recently three provisionals have gained full membership. The clubhouse now has a ramp access for the disabled, funding for its construction totally provided by the canteen. The various public running and special days have been well serviced without incident. This includes several birthday groups.

Lake Macquarie Live Steam Locomotive Society Ltd
Location: *Off Velinda Street, Edgeworth*
Public Running: *Last Sunday*

New Plymouth NZ

A new trolley bogie has brought in by Martin and viewed. Work has commenced on the new boundary fence aznd the new track overpass bridge. Track repairs and maintenance continues. Jan Jager has taken over the Hon Secretary job from Bernard (ill health). Track running through July was headed by The Challenger, the Dsa and the WW came in when the diesel expired.

New Plymouth Soc. of Model Engineers
Location: *Cnr Liardet and Gilbert Sts, New Plymouth*
Public Running: *Every Sunday*

Petone NZ

Some amazing weather (for Wellington) at the beach track has given the club some good runs during the winter months, with *Speedy* and #2970 doing most of the passenger work.

Hutt Valley Model Engineering Soc. Inc.
Location: *Marine Parade, Petone*
Public Running: *Every fine Sunday*

Perth WA

The club has been informed by the governing authority that they will be staying in the park at Wilson. The area in the convention loop has been levelled and graded and the area grassed hopefully ready for the summer season. The Canning section of track is ready for signals and rodding to be installed.

Castledare Miniature Railways of WA
Location: *Castledare Place, Wilson*
Public Running: *1st Sunday*

Tauranga NZ

This year is the 21st anniversary of the forming of the Tauranga Model, Marine and Engineering Club and celebrations are being planned. "Nigels Revenge" has been purchased by the club

Tauranga Model Marine and Engineering Club
Location: *Memorial Park, Tauranga*
Public Running: *Every Sunday*

Townsville Qld

The AGM saw President Jeff Hague, Secretary Laurie Fielder and Vice Pres Ian Ruscoe returned unopposed and Darryl Harmsworth elected Treasurer. Many thanks to retiring treasurer, Roger Foley.

Work on installing the two 43ft QLX wagon bodies is nearing completion and will enable us to store rolling stock and locomotives above flood level. Colour light automatic signaling is progressing and will enhance safe running. A re-sleepering programme is in place, using plastic sleepers in place of rotten wooden ones. A business plan is being formulated to manage the 2005 Convention. Club meetings first Tuesday, visitors welcome.

Townsville & District Society of Model Engineers Inc
Location: *Lou Litser Park, Boundary Street, South Townsville*
Public Running: *Last Sunday*

What has your club been up to?

We all like to keep in touch!

Send a brief note to tell us!

Or post a copy of your **newsletter** - but make sure you use a highlighter pen to show the item you would like us to publicize. Remember to concentrate on news that appeals to AME's wide range of readers.

Vancouver Island BC

Vancouver Island Model Engineers have no monthly running days. They run offficially six times each year, Spring Meet, Fall Meet, 2 days in July and 2 days in August for the pleasure of the members and allow the public to ride. Members also play trains on the 2nd Sunday of each month.

Vancouver Island Model Engineers
Location: *7321 Lochside Drive, Saanichton BC, Canada*

Warner Qld

A failing water flow from the pump to the header tank saw a novel approach to get the job done (ie. lay a new pipe). Teams of workers were each 'contracted' to dig four metres of trench each. The carrot was a B-B-Q lunch, which was not to be consumed until the water flowed into the tank at job completion. Flying shovels and picks soon had the job done, lunch eaten and the afternoon spent recovering from the morning's exertions!

Qld Society of Model & Experimental Engineers Inc.
Location: *Lot 5 Warner Road, Warner*
Public Running: *None*

West Ryde NSW

With the council drainage works now well behind us, passenger rides have returned to more than normal figures with nearly 21,500 rides taken in 1999/2000. The Charity Day for the year achieved 2585 rides (which was up on last year).

The club has 73 full members and three provisional members. While the numbers have slightly increased, the active membership has increased significantly.

Around 2000 rides were taken on May and June running days and July was a top day with nearly 2900. This could be a result of extra publicity by TV Channel 7 on their *Sydney Weekender* program.

The old clubhouse and amenities have received a "tone-up". Stage 1 of the small retaining wall has been completed by Martin Yule and has improved track stability in the area. The big retaining wall has been completed. A big, muscle flexing effort by members has seen the old privet-ridden half-collapsed bank cleaned up and turned into a tourist destination. Two cantilevered signal gantries have been erected by Peter Shiels. These improve clearance and aesthetics in the area while the old gantry has gone to another Sydney club for further use.

Sydney Live Steam Locomotive Society
Location: *Anthony Road, West Ryde*
Public Running: *3rd Saturday afternoon*

Farewell

We say goodbye and thankyou to these model engineers who have passed on:

Norm Decke (Tauranga MM&EC)
Jack Hicks (Lake Macquarie LSLS)
Harold Joynt (Auckland SME)
Jack Nears (Auckland SME)
Russell Smith (Lake Macquarie LSLS)
Allen Sykes (Lake Macquarie LSLS)

and extend our condolences and best wishes to the family and friends they leave behind.

North Queensland Safari

1 to 13 May, 2001

Come to sunny North Queensland in May!

Run on five great tracks from Maryborough in the south to Wonga Beach near Mossman in the balmy north!

Over the past few years an ever increasing number of live steamers have been making an annual safari to the north, visiting clubs en-route, all on an ad hoc basis. Following the Brisbane Convention, this year the clubs up the coast opened in sequence to cater for a larger number of visitors 'joining the safari'. Because it was an outstanding success, the clubs have all agreed to make this an annual event. Why not organise your vacation now and visit our part of Australia (*the best part ... Ed*). You won't be disappointed. The tracks you will visit are:

Tues 1 - **Maryborough**
Thur 3 - **Rockhampton**
Sat 5/Sun 6 - **Mackay**
Wed 9 - **Townsville**
Sat 12/Sun 13 - **Pinnacle Village**

All tracks are 5" gauge only with the exception of Townsville which also has $7^1/_4$". Most also have a small circle for $3^1/_2$" gauge.

The Pinnacle Village is in Vixies Road, Wonga Beach where discount on-site accommodation is available along with camping and powered sites. For further information on the Village you can phone (07) 4098 7566 or email:

pinnvill@internetnorth.com.au

For further details on the Safari:

L Heaton, PO Box 150, Walkerston Qld 4751 or phone (07) 4959 2169.

Coming Events

27 to 29 January 2001

70th Birthday Bash — Hamilton NZ

A special invitation to all model engineers to help us celebrate our 70th Birthday. Track open 8am Saturday to 4pm Monday, food and drinks avail. all day to drivers, visitors and locos. Formal dinner Saturday night (please advise if interested), BBQ and night run (all Night) Sunday. Open to public each day 10am to 4pm. Shower/toilet facilities at track for those staying. Marquee seating avail. For catering purposes advise if attending to Valerie Ph. 64 9 8551 927 or email: vclark@waikato.ac.nz

24 February 2001

48th Birthday Run — Edgeworth NSW

Members of Lake Macquarie LSLS invite you to help celebrate with them on weekend of Saturday 24th. Sunday afternoon is normal public running, but visitors need not haul passengers. $3^{1}/_{2}$"/5" elevated and 5" & $7^{1}/_{4}$" ground level. Full camping facilities, refreshments avail. For catering purposes, advise if attending. All welcome with ot without models. Contact Secretary Joe Huntley (02) 4954 0358

March

Model Boating Regatta — Cheltenham VIC

The Melbourne Model Boat Club wishes to invite all Scale Model Boating Clubs to their first Annual Model Boating Regatta to be held at the Sir William Friars Reserve, Cheltenham. The event will be held to coincide with the Melbourne Moomba Festival, an extremely good time to visit Melbourne. Contact: Melbourne Model Boat Club, 4/87 Medway St. Box Hill North, Vic 3129.

13 to 16 April

AALS 45th Convention — Salisbury North SA

The Penfield Model Engineers Society is hosting the next AALS Convention at the Penfield Park railway Grounds in Salisbury North, part of the Adelaide metropolitan area. More details elsewhere on this page. Convention Secretary, PO Box 792, Salisbury SA 5108

20 April to 7 May

Cane Locomotive Gathering - various

Further details on this page.

1 to 13 May

North Queensland Safari — various

Come and enjoy two weeks in the sun! Run on 5 different tracks from Maryborough in the south to the idyllic Pinnacle Village at Wonga Beach in the north — 7 days running! See previous page for full details

10 to 14 January, 2002

Modex 2002 — Palmerston North, NZ

The Palmerston North Model Engineering Club is hosting MODEX 2002, the NZ International Convention and Exhibition. More details on this exciting event will be published in later issues. Contact address is MODEX 2002 Registrations, 21a Hereford St, Palmerston North, New Zealand. Ph. 64-6-355-7000, Fax 64-6-355-7008 or email: modex2002@clear.net.nz

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45th AALS Convention - Salisbury North SA

The Penfield Model Engineers Society Inc, on behalf of the Australian Association of Live Steamers, invite all members of the model engineering fraternity to attend the 2001 convention to be held at their grounds at Salisbury North on 13 to 16 April. Salisbury North is a northern suburb of Adelaide, approx. 20k from the city centre.

Penfield Park Railway

Currently there are 1.2k of dual gauge $7^{1}/_{4}$"/5" ground level railway with 250 metres of sidings, a loading bridge, turntable, loco shed, storage bays, a station and two bridges. A separate 5"/$3^{1}/_{2}$" elevated track of 250 metres encircles the boat pond. All tracks are to AALS standards and loco wheel flange thickness must not exceed the AALS narrow gauge standards.

General

- Track marshalls will be located around the track to ensure safe running
- Signals are basically a route indicator and situated prior to a motorised set of points
  - Green - next points set for straight track
  - Yellow - points set for turnout
  - Red - points not set correctly
- Maximum speed is 8 kph and 100 metres distance to be kept between trains at this speed. At other times driver must be able to stop in half the visible track ahead.
- Night running - white light at front and red at rear
- Char, briquettes and Newcastle coal supplied. Petrol not supplied, must be in suitable container, labelled and may be stored in designated area.
- Water, steam and lubrication oil will be available
- Steaming bays have compressed air as well as 12V and 240V power.
- Workbench, drill press, lathe and a grinder available in the workshop building

Other attractions

Places of interest convenient to the Convention site are:

Steam Ranger - steam railway trips
Steamtown, Peterborough
Pichi Richi Railway
SA Maritime Museum
Port Dock Railway Museum
Blue Bird Rail - Barossa Valley trains and winery tours

Visit the Penfield Model Engineers Society website at:
http://www.picknowl.com.au/homepages/loanlynn/pmesone.htm
For further information contact:
The Convention Secretary, PO Box 792, Salisbury SA 5108

Australian Minature Cane Locomotive Gathering

Friday 20 April to Sunday 6 May, 2001

Interested in the Queensland sugar industry narrow gauge tramways?

Do you own a model of a cane loco?

If the answer to either of these questions is yes, this is the event for you — a once only tour of some of the top tracks in the country with other cane loco enthusiasts. $3^{1}/_{2}$", 5" and $7^{1}/_{4}$" tracks will all feature.

Venues visited are **Bob Farquhar's** track (Repton), **Lake Macquarie** Live Steamers, **Russell's Ridge Railway**, **Smokey Mountain & Grizzley Flats Railway** (Wyong), **Central Coast** SME (Gosford), **Hornsby ME** (Galston), **Sydney SME** (Luddenham), **Sydney Tramway Museum**, **Weavering Light Railway**, **Illawarra Light Railway Museum** (Albion Park), **RTM Dinner Train** (Thirlmere), **Illawarra Live Steamers** (Wollongong), **Berry Railway**, **Tumbarumba Railway**, **Wagga Wagga SME** and **Orange SME**.

(Note — Tour itinery is slightly amended from what was listed in the last issue to allow more relaxation time. Full and finalised tour details will appear in the next issue)

This is a once only event and the occasion will be marked with a limited number of mementos. There will be miniature brass loco style builders plates, coffee mugs, wine glasses, book, video, commemorative port and stickers available, the costs of which will be shared jointly by the participants. **The Wagga Wagga public running day is the only day on the tour where the track will be shared with non-tour locos**.

Tour organizer, Andy Roberts is a driver on the Farleigh Mill lines near Mackay in Queensland, owner of a 5" cane railway and 2 locos at North Eton and author of two books on the sugar trains.

For further information of the tour and costs, contact Andy in writing C/- Eton Post Office, Qld 4741 or by phone (07)4954 1206 or fax (07)4954 1209

In NSW, if you prefer, you can contact Mark Carney on (02)9644 1131

Grandchester Live Steamers' Second Birthday Run

Story and photos by Dave Harper

August 6 was the occasion of the Grandchester Model Live Steamers second birthday celebration at their track west of Ipswich. It was good to take a run out there and meet the crew again, and I had an extra reason for going — I could give *Red Fred* a run around their track!

The weather, as usual in sunny Queensland, was as near perfect as makes no difference, and a good selection of locos was circulating, giving rides for the locals. I tried to pick a few different shots this time, like **photo 1** — the narrow gauge loco and its cute little guards van which was immediately christened 'the mobile dunny!'

It features again in **photo 2**, but this really shows what the day was all about —tinkering with trains and talking! For all the talking, I still didn't get the name of the builder!

The station area was busy all day, **photo 3** shows a typical scene with IC locos dominant. The country and music group under the awning added a bit of country atmosphere to the proceedings...

Finally, **photo 4** is of young Jim Hurst checking over Graham Prisk's AC16 —painted up as an original 'Yank' in the colours of the USA Transportation Corps the livery they were in when delivered to QR during WWII. Jim is the regular driver for Graham at the Bribie MELSA track, dressed in his full QR uniform — goes over well with the customers!

How did *Red Fred* go? Well, he did two laps of the main track; at the end of each lap when I signalled him to stop, he didn't! A desperate grab as he went by and lifting the lid of the A wagon showed that the radio receiver batteries had popped out of their holder! There must be one heck of a bump somewhere around the track! Anyway, I spent the rest of the time shuttling up and down the bay siding, keeping out of the way — all in all a very pleasant day, and it's good to see this new club progressing so well.

Keep it up, fellers!

Photo 2

Photo 3

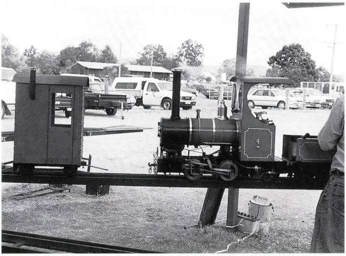


Photo 1

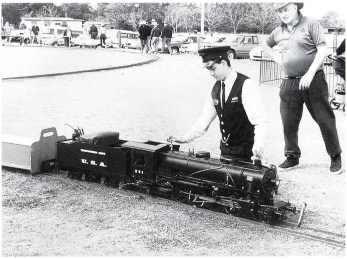


Photo 4

Letter Box

Letterbox Contributions

You are welcome to send letters by mail to:

PO Box 21, Higgins, ACT, 2615 or
fax to: (02) 6254 1641 or
e-mail to: **amemag@bigpond.com**

As far as possible, AME is an open forum for all members of our hobby. Therefore, all expressions of fact or opinion as long as they are not libellous will be considered for publication.

Please **type or clearly print** your letters, as script is often difficult to interpret. Due to the popularity of *Letter Box* and the limited space available, letters of **400 words or less** will have a better chance of being published.

Tethered cars

Sir,

I am writing to enquire as to who may be able to help me with details on tether cars.

I and some others want to set up a track in Darwin and I need all relevant details of track and car construction, addresses of component suppliers, etc. Are there any publications/manuals on tether cars, or catalogues of car components. I thank you in advance for your time and assistance.

Graham Angel
5-9 Timpson Court
Gray NT 0830

(If anyone is able to assist Graham with any of this information please do so. Unfortunately at AME we have no contact with the tethered car fraternity or access to information. Perhaps some of you tethered car buffs out there could put pen to paper and share your hobby with us all ... Ed.)

Know this compressor?

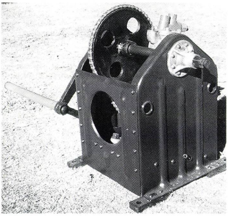
Sir,

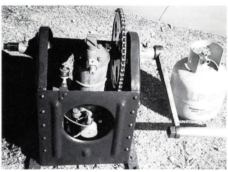
I was wondering if someone could please tell me exactly what this compressor was used for. It is hand operated. The compressor body is made of brass with pressed steel outer frame with old hand rivets. Oiled by old drip oiler and grease caps on other moving parts, 8 in total. As far as I can find out it may have been used to pump air down to divers. I wonder about this as the head off the compressor is stamped: "**tested 750lbs**"

The name plate is worded

LACY-HULBERT & CO LTD
PNEUMATIC
ENGINEERS
LONDON No. 6143

Cecil Longford
Queensland





Milling machine

Sir,

I have just read in the September/October edition of AME the Product Review on the X5015 vertical milling machine from Minitech, Brisbane.

I heartily agree with the comments made in the review as I have just bought one of these machines and have found that it is an excellent piece of gear.

Years ago I had one of the round-column units, but this machine is far superior in every way. I consider that the best feature is the ability of feeding the job up into the cutter, rather than the cutter down as was the case on the RF30.

I am in the process of building my riding trolley for my 5" gauge Railmotor, and I have used it to mill out the axle slots and other associated milling to my greatest satisfaction. I also have a set of castings for a horizontal mill engine ready to go.

I think the magazine is great, so keep up the good work!

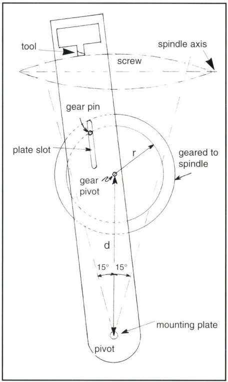
Graham Lane
Tasmania

Reversing gear and springs

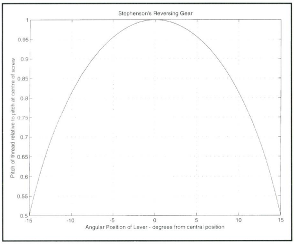
Sir,

A useful feature of Stephenson's reversing lever (AME 91 page 20) not reproduced in Ken Gifford's fine model is the varying pitch of the screw. Scaled from the drawing, the pitch at the limits of travel is about half that in the centre. This results in twice the mechanical advantage (and half the travel per rotation of the handle) at the limits of travel compared to the centre.

Such a screw could be manufactured with a setup similar to Mr Gifford's excepting that the carriage would be locked and the (now slotted) moving plate driven from a pin carried on a rotating wheel similar to the 'quick return mechanism' utilised in shaping machines (see **diagram**). In order to double the pitch and to obtain a thread with eleven turns in the +15° movement of the reversing lever, some trigonometry shows that the ratio of **d/r** needs to be 3.346 and the rotating wheel must be geared to the lathe spindle in the ratio of 5:132. How this could be done may need some imagination!



On another topic, Mr Johnson's method of measuring spring stiffness (AME 91, page 21) assumes that the springs within the 'bathroom or kitchen scales' do not deflect under test, whereas they will actually support the same force as the spring on test and deflect accordingly. As sketched, the 'ruler' measures the total



deflection of both these springs in series. An improved measurement will be achieved when the lower end of the ruler is placed on the upper platform of the bathroom or kitchen scales and allowed to move with the platform.

R Entwistle
Western Australia

Sending articles overseas

Sir,

I read with interest the letter from Alan Holt (WA) in which he comments on local ME's sending articles off shore and thought perhaps a few word in reply would be appropriate, if horribly late!

Speaking as one who has been in the hobby for twenty odd years, a sometime writer with articles published in ME and ME's Workshop (UK) Live Steam (US) and our own worthy local product I should like to point out in explanation (not, I hasten to add in defence) that:

1. My own humble contributions started before this magazine did.
2. Early (teething?) problems with the magazine led to unacceptable delays in publication — thankfully this problem has now been rectified.
3. Having established contact/credibility with the overseas magazines, one does not like to break the connection, however occasional the offerings, and
4. While Alan is correct in saying that the payment for these articles is not huge, it is something. There is always some cost involved in the production of an article and, as one on a strictly limited income, one does have to try to offset these costs where possible. In point of fact, one could say that the payments received from this source go some way to subsidising the articles slated for local publication. Certainly this is so in my case.

While I can not speak for other writers who follow this path, the number of them who have work published offshore and who also contribute to 'ours' lead me to believe that at least some of the points above would apply to them also.

Hope this makes the position a little clearer to Alan and anyone else who has been wondering.

Terry Lane
New South Wales

Pneumatic hammer

Sir,

The blacksmith's hammer illustrated (AME issue 91, page 28) is a oneumatic hammer. The rear cylinder is the compressor and is driven via the crankshaft and geared wheel by an electric motor.

Photo 2 shows the operating handle down near the compressor crankshaft. The handle is connected to a circular valve between the two cylinders. The valve is constructed with a number of shuttles on the one shaft and allow air to lift or drive the hammer as required by the hammer driver.

About 25 years ago trouble was developing with the 100-ton hammer at the main railway workshops with both the control and force of the blow. Removing the valve involved lifting a section of the building roof and mounting a chain block to lift and lower the valve to the floor. Sections of the valve bosses were worn. The various sections float on the main operating shaft. There was absolutely no details available as to the correct lengths of the sections. Repair consisted of a number of trials with differing thicknesses of washers to compensate for wear. Eventually the hammer was passed as very satisfactory and returned to service.

H R Wilkes
New Zealand

Have you noted AME's new email address yet?
amemag@bigpond.com

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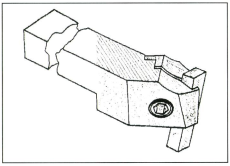
Product Reviews



The Diamond Tool Holder

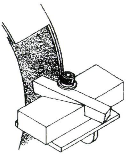
About eight years ago I wrote that the Diamond Tool Holder was "A Revolutionary Lathe Tool holder that makes metal turning a breeze" well, I still think it is!

The very clear instructions which come with this unique device, state that the Diamond Tool Holder is "Simple to use. Simple to sharpen." After ten years of use my tool holder is still as good as it was when it was first attached to the tool post. The Diamond Tool Holder uses a normal High Speed Steel tool bit and can be used for: roughing, finishing, shoulder facing as well as screw cutting. With the tool holder available in four size configurations it gives you a choice, depending on lathe centre height, type of tool post and size of tool bit required.

Sharpening

To sharpen a conventional tool bit correctly can take from several minutes to half an hour or more depending on your experience. Using the Diamond Tool Holder grinding jig you count the sharpening time in seconds, regardless of experience. Unfortunately you can't use a tool bit ground for the Diamond Tool Holder in a conventional tool holder. Although after using the Diamond Tool Holder I have no intention of using a conventional tool holder anymore!

The sharpening jig also has a nifty way of sharpening points to 55 or 60 degrees. It takes a bit of fiddling to set the adjusting screw right the first time, although after the initial adjustment you could grind up 100s of thread cutting tools, and they'll all be identical. You can only adjust the jig for one thread angle at a time. In fact, this isn't really a problem due to the ease of changing the set-up.



Using the tool

You can safely use your HSS tool bits from full-length to the little scrap ends in this holder. However you might need to halve a full-length tool bit if the lower portion of the bit fouls the compound slide when you swivel the tool post. My Diamond Tool Holder uses the $^1/_4$" square HSS tool bits and has been used to machine many model components and I am always satisfied with the results. The depth of cut is only limited by the size of the tool bit, and at $^1/_4$" depth it cuts the steel away without any hesitation. The chip form is good and the surface finish is excellent. The tool performs just as well for light finishing cuts and facing cuts.

Safety

The tool holder has a great feature that is ideal for the novice machinist or student (Industrial Arts teachers can breathe easy around their students with this one). If the tool is overloaded or even misused (never!) the tool bit can slide down into the holder safely out of the way, avoiding broken tool bits and chunks out of chuck jaws. The tool bit doesn't slip through the holder under normal operating conditions.

You can obtain further information from the manufacturers. But before contacting them, measure the dimension on your lathe from the base of the tool-rest to the lathe centre. This dimension is a major factor in deciding which tool holder you will need. Finally, don't let the price put you off, it really is worth every cent.

Diamond Tool Holder

Price: from $84, Post $7 Australia wide.

Available from: D & P Burke Toolmakers, 27 Woodstock Road, Mount Waverley, Vic 3149 or Phone:(03) 9807 6316 Fax:(03) 9807 9620

Brian Carter

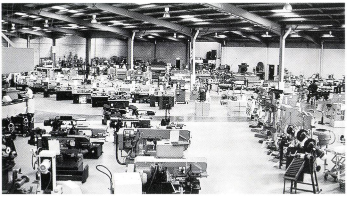
New Location, New Name, New Dimension

After 70 years in business and 45 years on the same spot in George Street, Parramatta, the family-owned machinery merchant, Hare & Forbes has moved to brand new premises in North Parramatta.

Trading under the new name of HARE & FORBES MACHINERY HOUSE, the company has over 3000 square metres of display area featuring new and used workshop machinery. The display also features a new dimension for Hare & Forbes — an extensive machine tool accessory division, including many top quality European brands such as Skoda, Narex and TOS.

The new location at the corner of James Ruse Drive and Windsor Road provides easy access and 280 car spaces.

To celebrate the opening of their new premises, Hare & Forbes Machinery House will hold a four day sale from 9 - 12 November, featuring demonstrations of woodworking and metalworking machinery and huge savings on machinery purchases.



News Desk

with David Proctor

Welcome to the last issue of the millennium. I see that most of you are now using the new contact details for AME, but there are a few who still use the old email address. As the old email address (ame@dynamite.com.au) will cease to operate on November 13 here again are the details for AME and AME Retail

AME's new email address is:
amemag@bigpond.com
AME Retail postal address is
PO Box 21 Higgins ACT 2615.
Phone/fax: **(02)6292 1938**
Email: **jpoliver@webone.com.au**

From last issue

Sparks 'n' Arcs — Murdoch Finlay refers to Bob Field's article on power and the reference to "Jim uses symbol E for voltage whereas I have used V (current usage)". With 60 years experience in the field, he advises that the two symbols have been used for many years for two different aspects of voltage. The symbol E is used to denote EMF (Electro Motive Force), which is the open circuit or no-load voltage of a power source. The symbol V is used to denote the voltage drop across a part of a circuit.

Vancouver Island Spring Meet — the photographs were taken by Richard Andersen, not Dennis Dalla-Vicenza as stated. In fact Dennis is in one of the photos.

Steam Locomotive in Australia and New Zealand — Anatole Mallet was Belgian, not French. The Norfolk & Western Y6B with a starting T.E. of 146,000 lbs and the Virginian 2-10-10-2 with 176,000 lbs T.E. could claim to be more powerful than the UP's *Big Boy* at 135,000 lb starting T.E. though speed was severely limited.

Clarification

Oz Engines Pty Ltd of Engadine are anxious that they be in no way connected with Bruce Allen's *Oz Engine* as featured in the July-August issue. The use of the same name could lead people to mistakenly contact them.

NZ locomotive drawings

Anyone who is intending to build a model of a New Zealand engine may obtain drawings from the **Tranz Rail Design Office**, PO Box 3129, Wellington NZ. phone (04) 498 3000 ext. 44222. The man to contact is Carl Vercoelen. He can supply a summary (or list) of engineering drawings for most NZR locomotives, wagons and carriages for around $10. The A3 size workshop drawings are about $15 each or less depending on quantity ordered.

AME Retail

We are looking at expanding the range of items which are available through AME Retail, perhaps workshop, road steam, stationary engines, etc. If you have any thoughts about what you think should be in stock, or where they can be obtained, how about sharing them with John and Phyl Oliver at AME Retail (*contact details elsewhere in this column*). Followers of NSW railways are already well catered for.

I hope you have a safe and happy holiday season and that Santa puts something really useful in your stocking.

Australian Model Engineering

New Subscription Form

Post: **PO Box 21, Higgins ACT 2615. Australia**
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November-December 2000

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Scale Steam Locomotives & Rolling Stock (reg.)

- Specializing in Victorian Railways Steam Locomotives, Rolling Stock and Accessories in 5-inch gauge. Currently under construction, or presently available, are Z and ZL Goods Vans, GY's, I and IY's, S and Q Flat Top Bogied wagons, E Steel Bogied Gondolas, K Flat Top wagons, T Goods wagons, Oil and Acid type tankers and P Explosive wagons (others hopefully to be produced soon). All wagons are complete and ready-to-run with individual coding and numbering, auto couplings and air hoses and finished painted in any of the colour schemes used by the Victorian Railways. Now under construction are two (2) Victorian Railways N class 2-8-2 type locomotives in 5-inch gauge, and both will be offered for sale as ready-to-run. For further inquires on our products, or if you would like a copy of our complementary Catalogue, please contact Erik or Dennis at our address by mail, phone, fax or e-mail us at Scale Steam Locomotives & Rolling Stock (reg.) PO Box 492, Daylesford, 3460, Victoria, ph/fax: (03) 5348 4135, e-mail: steamers@netconnect.com.au

5" gauge loco for sale

- Brand new 10 class 2-8-2 tank loco with hopper truck and brake van. Certified copper boiler. Details: Tony (02) 6722 4460 or www.users.bigpond.com/windyhills

Drawings for sale

- Simple Mini steam unit for beginners as published in AME. Set of 9 bound drawings $10.00. Contact S Reeves (08) 9354 1395. 24 Lyndale Ave, Parkwood WA 6147 or email:spreeves@bigpond.com

Traction engine for sale

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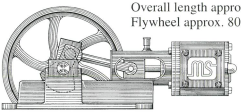

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Flywheel approx. 80mm dia.

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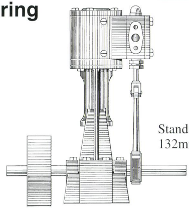

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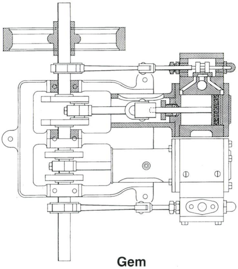
Echuca
Single Cylinder Vertical: 20mm bore x 19mm stroke

Overall length approx. 154mm
Flywheel approx. 80mm dia.



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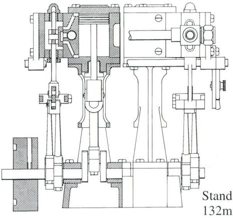

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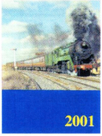

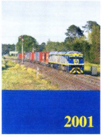

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